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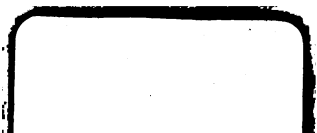
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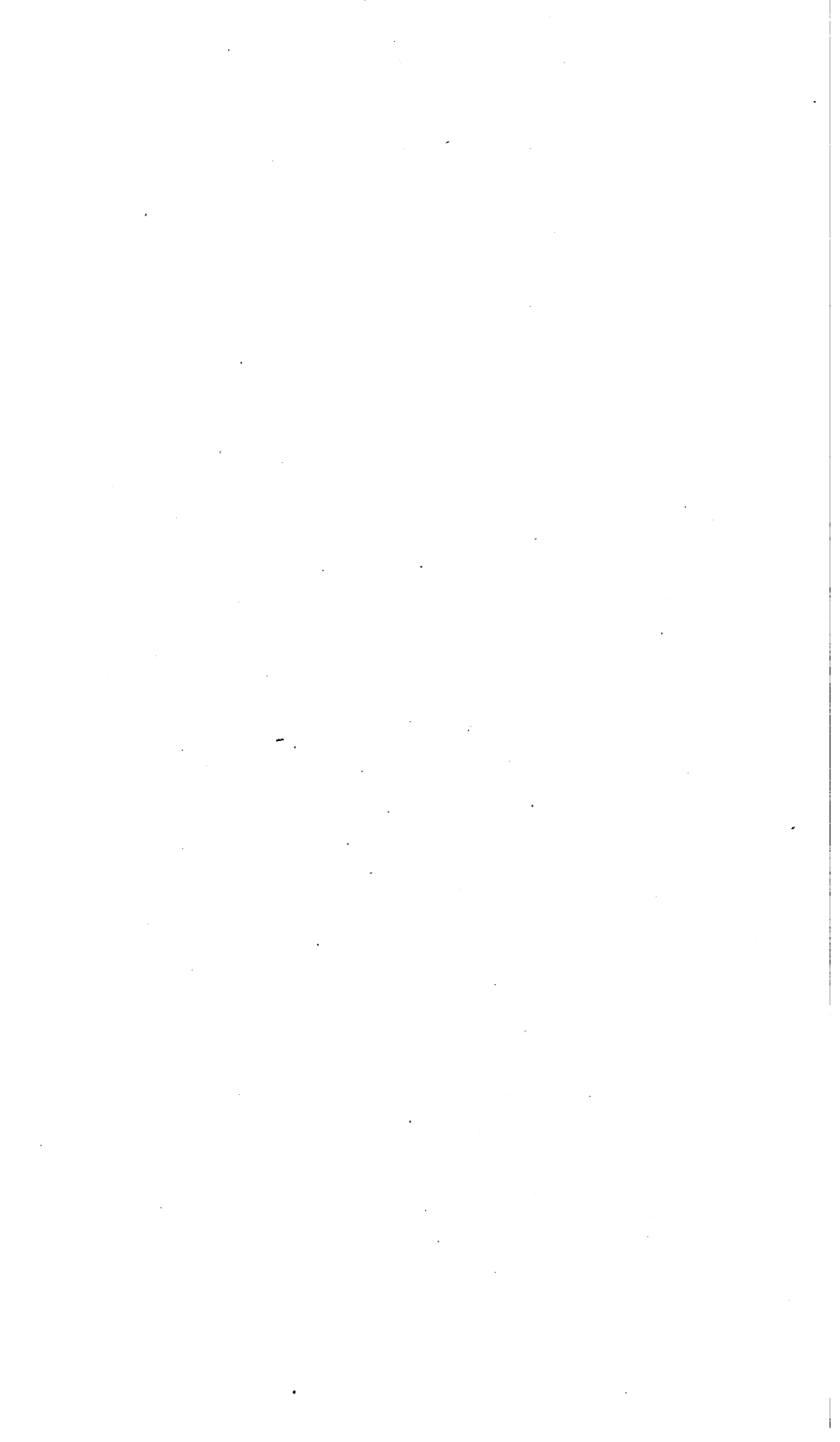
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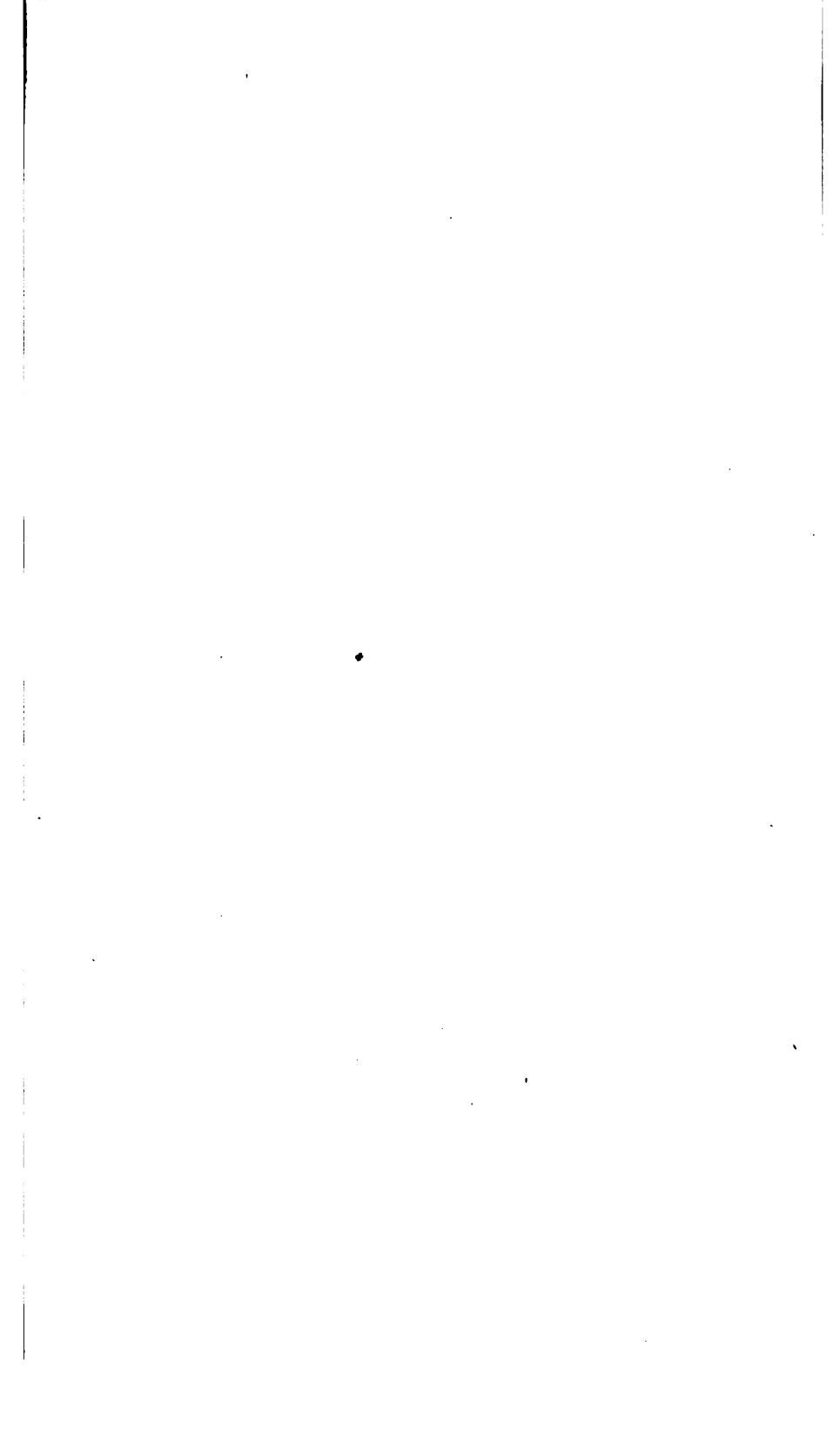
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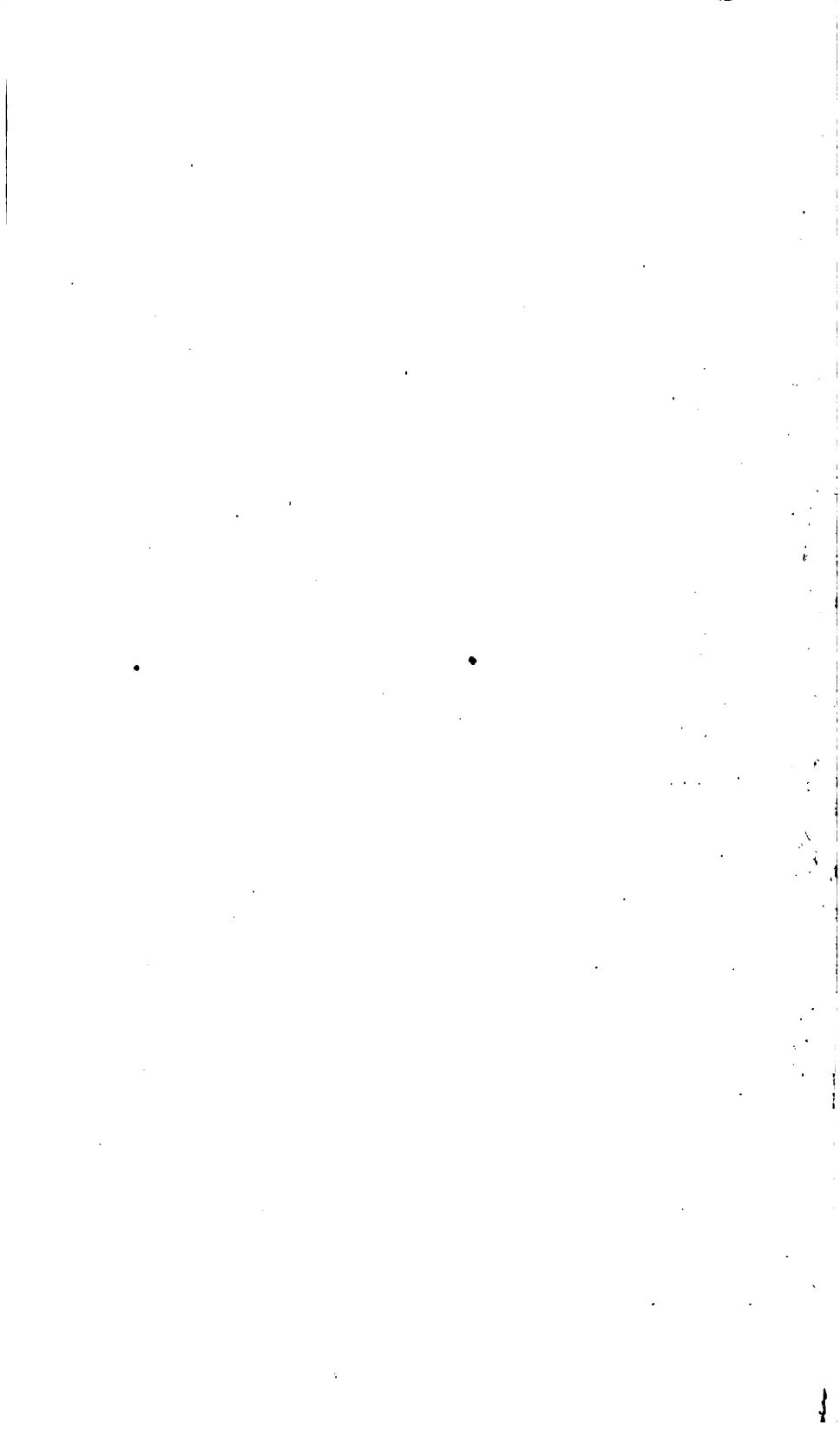


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✓ ARCHIVES

OF

USEFUL KNOWLEDGE,

A WORK DEVOTED TO

COMMERCE, MANUFACTURES,

RURAL AND DOMESTIC ECONOMY,

AGRICULTURE,

AND THE

USEFUL ARTS.

BY JAMES MEASE, M. D.

Secretary to the Agricultural Society of Philadelphia.

VOL. I.

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D. CALDWELL, Clerk of the
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PREFACE



IN presenting the first volume of the "ARCHIVES OF USEFUL KNOWLEDGE," to the world, the editor has great satisfaction in being able to say, that his labours have been well received, and that the encouragement has been such as to warrant a belief, that all the good which he wished or expected they might produce, will take place. He will steadily keep in mind the leading objects embraced by the work, and endeavour so to arrange the materials as that a proportion of every number shall be occupied by the several subjects forming the title page. They are all intimately connected, and mutually dependant upon each other for their extension, prosperity, and perfection. It is by Commerce that the farmer finds a sale for his produce; by Agriculture, and the introduction and multiplication of Arts and Manufactures, the merchant procures materials for his distant expeditions; while all classes,—those who contend with the waves,—who plough the earth,—or the artists who decompose the raw materials of nature, and contribute so largely to the luxury, or to the real wants of mankind, are all greatly benefited by the extended knowledge of DOMESTIC ECONOMY.

It has been said, that we only begin to know how to live, when we are about to leave the world : and it is certain that the comforts of mankind would be much increased, were the knowledge of this last mentioned branch more studied, or not thought below the attention of the Philosopher. The immortal Franklin, while engaged in the sublimest discussions of science, did not neglect the improvement of the arts of life : other eminent men have largely contributed to their increase ; and at the present moment, the economists of France are busily engaged in discovering various new means to preserve animal and vegetable substances from decay, and in collecting all the scattered knowledge on that subject from works in every language ; and we may expect from their labours a great fund of information. The editor being in regular correspondence with the useful character* charged with the arrangement of the collected mass of instruction, expects to receive a copy of the work, the riches of which he will infuse into his pages. In the mean time, he will give all the facts upon that interesting subject, that he has met with.

The art of Dying, which is far from having arrived at perfection in Europe, and is but in its infancy in this country, is essential to the extension of our manufactures, and will claim a particular share of attention.

* Mr. Lasteyrie, so well known by his publications on sheep.

PREFACE.

In the first number of the 2d Vol., an interesting experimental paper will be given on this subject, from a French author.

BIOGRAPHY is History teaching by example. The lives of men who have raised themselves to eminence, by their ingenuity, their method in business, and regularity of their lives, are not only highly interesting, but useful to the young. Accounts of such characters shall occasionally be given in the future numbers of this work. To the various improvements in Steam Engines, by Bolton and Watt, in Cotton and in Wool machinery, by Arkwright and Cartwright, Britain owes a very large proportion of her wealth and resources.

The pages of the Archives are offered to ingenious Mechanics, to give to the public the result of their labours in the invention or improvement of useful implements or machines; and to the patriotic American, as a vehicle for any discovery or useful art which he may be at the pains to introduce from Europe into this country. The addition of a single art, or a single mechanic following a branch of business not already in the country, adds more to the national wealth,—to the solid resources of the Union, than the introduction of thousands,—of tens of thousands of fleeting moveable dollars.

In the first number of Vol. 2d, of the "Archives," will be given, among other articles, papers on the following interesting subjects:

1. On the application of lime as a Manure.
2. On an economical and effectual mode of warming large rooms and public buildings,—with a plate.
3. Description of a neat and useful Stove for warming small rooms, and halls,—with a cut.
4. Description of the New-York wheel-head, for wool-spinning,—with a cut.
5. On Mordants employed in the Art of Dying, by the director of the French National Dying establishment.
6. A certain method to prevent the destruction of wheat by the wheat moth.

Directions to the Binder.—The plate of Don Pedro to face p. 104.

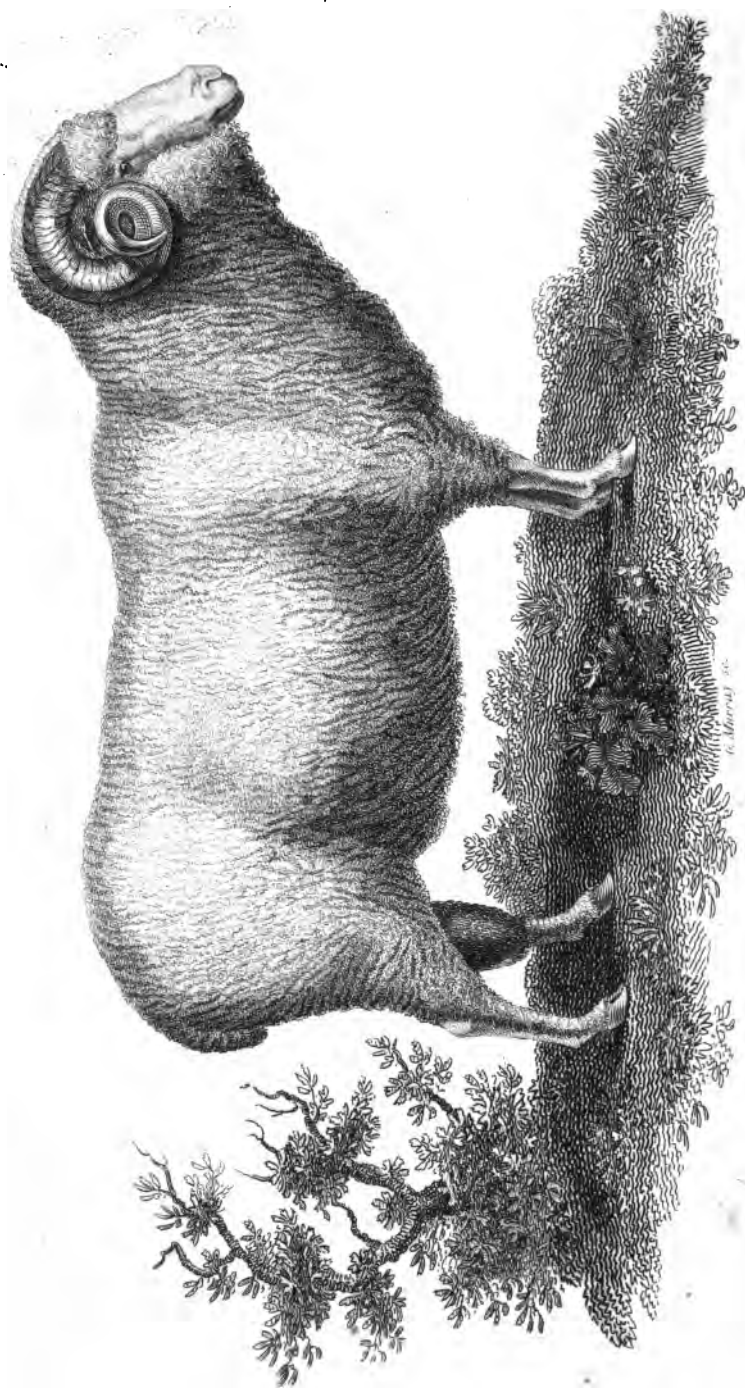
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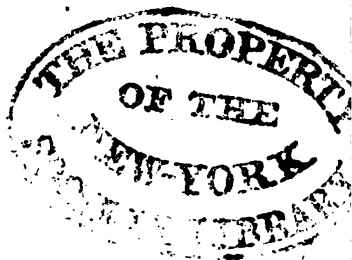
DON PEDRO

The Publisher of the *Archives of Useful Knowledge*

ARCHIVES

OF

USEFUL KNOWLEDGE.



VOL. I.

JULY, 1810.

No. 1.

METHOD OF MANUFACTURING ISINGLASS.

THE following account of the manufactory of Isinglass is the only one ever published. It is the result of a journey to Russia, expressly undertaken to discover the process, and of numerous experiments upon British fish, by the late Humphrey Jackson, of London, and published by him in the Trans. Royal Soc. vol. 63.

THE secret of Isinglass rested a long time solely with the Russians, and made from the fish *Huso*,* or Isinglass Sturgeon; and its name in Greek signifies fish-glue, viz. *ICHTHYO-COLLA*. All authors who have hitherto delivered processes for making fish-glue, or Isinglass, have greatly mistaken both its constituent matter and preparation. To prove this assertion, it may not be improper to recite what a writer of the name of Pomet says on the subject, as he appears to be the principal author, whom the rest have copied. After describing the fish, he says, as to the manner of making the Isinglass, the sinewy parts of the fish are boiled in water till all of them be dissolved that will dissolve, then the gluey liquor is strained and set to cool. Being cold, the fat is carefully taken off, and the liquor itself is boiled to a juicy consistency, then cut to pieces and made into a twist, bent in form of a crescent, as commonly sold, then hung upon a string and carefully dried. From this account it might rationally be concluded that every species of fish, which contained gelatinous principles, would yield Isinglass; and this parity of

* Accipenser Huso Lin.

EDIT.

reasoning seems to have given rise to the hasty conclusion of those who strenuously search for the extraction of Isinglass from sturgeon, but as that fish is easily procurable, the negligence of ascertaining the fact, by experiment, seems inexcusable. In my first attempt to discover the constituent parts and manufacture of Isinglass, relying too much upon the authority of some chemical authors, whose veracity I had experienced in many instances, I found myself constantly disappointed. Glue, not Isinglass, was the result of every process.

No artificial heat is necessary to the production of Isinglass, neither is the matter dissolved for this purpose, for as the continuity of its fibres would be destroyed by solution, the mass would become brittle in drying, and snap short asunder, which is always the case with glue, but never with Isinglass; the latter indeed may be resolved into glue with boiling water; but its fibrous recombination would be found impracticable afterwards, and a fibrous texture is one of the most distinguishing characteristics of genuine Isinglass. A due consideration, that an imperfect solution of Isinglass, called *finings* by the brewers, possessed a peculiar property of clarifying malt liquors, induced me to attempt its analysis in cold subacid menstruums. One ounce and a half of good Isinglass, steeped a few day in a gallon of stale beer, was converted into good finings of a remarkably thick consistence. The same quantity of glue, under similar treatment, yielded only a mucilaginous liquor, resembling diluted gum-water, which instead of clarifying beer, increased both its tenacity and turbidness, and communicated other properties in no respect corresponding with those of genuine finings. On mixing three spoonfulls of the solution of Isinglass with one gallon of malt liquor in a tall cylindrical glass, a vast number of curdly masses became presently formed by the reciprocal attraction of the particles of Isinglass and the feculencies of the beer, which increasing in magnitude and specific gravity, arranged themselves accordingly, and fell in a combined state to the bottom through the well known laws of gravitation; for, in this case there is no elective attraction, as some have imagined, which bears the least affinity with what frequently occurs in chemical decompositions.

If what is commercially termed *long* and *short stapled Isinglass* be steeped a few hours in fair cold water, the entwisted

membranes will expand and reassume their original beautiful hue,* and by a dexterous address may be perfectly unfolded. By this simple operation we find that Isinglass is nothing more than certain membranous parts of fishes, divested of their native mucosity, rolled and twisted into the forms above mentioned, and dried in the open air.

The sounds or air-bladders of fresh-water fish in general are preferred for this purpose, as being the most transparent, flexible, delicate substances. These constitute the finest sorts of Isinglass; those called *book* and *ordinary staple* are made of the intestines, and probably of the peritonæum of the fish. The beluga yields the greatest quantity, as being the largest and most plentiful fish in the Muscovy rivers; but the sounds of all fresh-water fish yield more or less fine Isinglass, particularly the smaller sorts, found in prodigious quantities in the Caspian sea, and several hundred miles beyond Astracan, in the Wolga, Yaik, Don, and even as far as Siberia, where it is called *kla* by the natives, which signifies a glutinous matter; it is the basis of the Russian glue, which is preferred to all other kinds for its strength. The sounds, which yield the finer Isinglass, consist of parallel fibres, and are easily rent longitudinally, but the ordinary sorts are found composed of double membranes, whose fibres cross each other obliquely, resembling the coats of a bladder; hence the former are more readily pervaded and divided with subacid liquors, but the latter through a peculiar kind of interwoven texture, are with great difficulty torn asunder, and long resist the power of the same menstruum; yet when duly resolved are found to act with equal energy in clarifying liquors.

Isinglass receives its different shapes in the following manner :

The parts of which it is composed, particularly the sounds, are taken from the fish while sweet and fresh, slit open, washed from their slimy *sordes*, divested of every thin membrane which envelopes the sound, and then exposed to stiffen a little in the air: in this state they are formed into rolls, about the thickness of a finger, and in length according to the intended size of the staple, a thin

* If the transparent Isinglass be held in certain positions to the light, it frequently exhibits beautiful prismatic colours.

membrane is generally selected for the centre of the roll, round which the rest are folded alternately, and about half an inch of each extremity of the roll is turned inwards. The due dimensions being thus obtained, the two ends of what is called *short staple*, are pinned together with a small wooden peg, the middle of the roll is then pressed a little downwards, which gives it the resemblance of a heart shape, and thus it is laid on boards or hung up in the air to dry. The sounds which compose the *long staple* are longer than the former; but the operator lengthens this sort at pleasure by interfolding the ends of one or more pieces of the sound with each other; the extremities are fastened with a peg like the former, but the middle part of the roll is bent more considerably downwards, and in order to preserve the shape of the three obtuse angles thus formed, a piece of round stick, about a quarter of an inch diameter, is fastened in each angle with small wooden pegs, in the same manner as the ends. In this state it is permitted to dry long enough to retain its form, when the pegs and sticks are taken out, and the drying completed; lastly, the pieces of Isinglass are collected in rows, by running packthread through the pegholes for the convenience of package.

The membranes of the book sort being thick and refractory, will not admit a similar formation with the preceding, the pieces, therefore, after their sides are folded inwardly, are bent in the centre in such a manner that the opposite sides resemble the cover of a book, from whence its name; a peg being run across the middle, fastens the sides together, and thus it is dried like the former. This sort is interleaved, and the pegs run across the ends, the better to prevent its unfolding. That called *Cake Isinglass* is formed of the bits and fragments of the staple sorts, put into a flat metalline pan, with a very little water, and heated just enough to make the parts cohere like a pancake when it is dried; but frequently it is over-heated, and such pieces; as before observed, are useless in the business of fining.

Isinglass is best made in the summer, as frost gives it a disagreeable colour, deprives it of weight, and impairs its gelatinous principles; its fashionable forms are unnecessary, and frequently injurious to its native qualities. It is common to find oily putrid matter and *exuviae* of insects between the implicated membranes,

which through the inattention of the cellar-man often contaminate wines and malt-liquors in the act of clarification. These peculiar shapes might probably be introduced originally with a view to conceal and disguise the real substance of Isinglass, and preserve the monopoly; but as the mask is now taken off, it cannot be doubted to answer every purpose more effectually in its native state, without any subsequent manufacture whatever, especially to the principal consumers. Until this laudable end can be fully accomplished, and as a species of Isinglass more easily procurable from the marine fisheries may probably be more immediately encouraged, it may be manufactured as follows :

The sounds of cod and ling bear great analogy with those of the *accipenser* genus of Linnæus—and are so generally well known as to require no particular description.

The Newfoundland and Iceland fishers split open the fish as soon as taken, and throw the back bones with the sounds annexed in a heap. But previous to incipient putrefaction, the sounds are cut out, washed from their slimes and salted for use. In cutting out the sounds the intercostal parts are left behind, which are much the best; the Iceland fishermen are so sensible of this, that they beat the bone upon a block with a thick stick, till the pockets, as they term them, come out easily, and thus preserve the sound entire. If the sounds have been cured with salt, that must be dissolved by steeping them in water before they are prepared for Isinglass; the fresh sound must then be laid upon a block of wood whose surface is a little elliptical, to the end of which a small hair brush is nailed, and with a saw-knife the membranes on each side of the sound must be scraped off. The knife is rubbed upon the brush occasionally to clear its teeth; the pockets are cut open with scissars and perfectly cleansed of the mucous matter with a coarse cloth; the sounds are afterwards washed a few minutes in lime-water, in order to absorb their oily principle, and lastly in clear water. They are then laid upon nets to dry in the air, but if intended to resemble the foreign Isinglass, the sounds of cod will only admit that called *book*; but those of ling of both shapes. The thicker the sounds are, the better the Isinglass, colour excepted; but that is immaterial to the brewer, who is its chief consumer. This Isinglass resolves into fining, like the other sorts in subacid

liquors, as stale beer, cyder, old hock, &c. and in equal quantities produces similar effects upon turbid liquors, except that it falls speedier and closer to the bottom of the vessel, as may be demonstrated in tall cylindrical glasses; but foreign Isinglass retains the consistency of fining preferably in warm weather, owing to the greater tenacity of native mucilage. Vegetable acids are, in every respect, best adapted to fining; the mineral acids are too corrosive, and even insalubrious in common beverage.

It is remarkable, that during the conversion of Isinglass into fining, the acidity of the menstruum seems greatly diminished, at least to taste; not on account of any alkaline property in the Isinglass probably, but by its enveloping the acid particles. It is likewise reduceable into jelly with alkaline liquors, which indeed are solvents of all animal matters; even cold lime water dissolves it into a pulposus *magma*. Notwithstanding this is inadmissible as fining, on account of the menstruum, it produces admirable effects in other respects: for, on commixture with compositions of plaster, lime, &c. for ornamenting walls exposed to the vicissitudes of weather, it adds firmness and permanency to the cement; and if common brick mortar be worked up with this jelly, it soon becomes almost as hard as the brick itself; but for this purpose it is more commodiously prepared by dissolving it in cold water, acidulated with vitriolic acid; in which case, the acid quits the jelly, and forms with the lime a *selenitic* mass, while at the same time the jelly being deprived in some measure of its moisture, through the formation of an indissoluble concrete among its parts, soon dries, and hardens into a firm body, whence its superior strength and durability are easily comprehended.

It has been long a prevalent opinion, that sturgeon, on account of its cartilaginous nature, would yield great quantities of Isinglass; but on examination, no part of this fish, except the inner coat of the sound, promised the least success. This being full of *ruga*, adheres so firmly to the external membrane, which is useless, that the labour of repeating them supersedes the advantage. The intestines, however, which, in the larger fish, extend several yards in length, being cleansed from their mucus and dried, were found surprisingly strong and elastic, resembling cords made with

the intestines of other animals, commonly called *cat-gut*, and from some trials, promised superior advantages when applied to mechanical operations.

REMARKS.

TOOKE informs us,* that besides the sturgeon and other fish, Isinglass is made from the sounds of shad in Russia, but that it is of an inferior quality. They are pounded, and as the glue does not entirely dissolve, it is strained, and the filaments separated from it. The experiments might be made with the sounds of the large shad, in the rivers of the United States.

The manufactory of Isinglass might become a very profitable branch of business to the people in the vicinity of our great rivers, in which sturgeon and shad abound. For it appears that before the revolutionary war, premiums were offered in England for Isinglass made from the fish of the colonies; in consequence of which several specimens of fine Isinglass were sent to England, with certificates as to the unlimited quantity that might be procured.

The sounds and tongues of codfish are carefully preserved on the Banks of Newfoundland, and put up together in kegs. The value of these is comparatively small with that of the article in question. If therefore the sounds be found to answer the purpose of making Isinglass, the alteration in the mode of preparing them may prove very profitable to the New England fishermen. A first or second experiment may not succeed; but the ingenuity of our countrymen will readily overcome the difficulty attending a new process; and the prospect of ample remuneration for their trouble will doubtless cause the attempt to be made.

During the late embargo in the United States, Isinglass rose to the enormous price of ten dollars per lb. and although it is probable that the same cause will not soon operate again, yet the political events of the continent of Europe may occasion another scarcity. There is every reason, therefore, to think that the manufacture of the article will pay well.

* Survey of the Russian Empire.

Good Isinglass is esteemed the finest and purest specimen of animal gelatin. It is without smell or taste, and entirely dissolves in warm water, forming the clearest and most colourless of all the known jellies.

Uses.—An excellent cement for joining glass may be made by evaporating the jelly of Isinglass to a proper consistence. The coarser sorts of fish glue, dissolved in water, are used as common glue. The finer sorts are much used in confectionary and for clarifying malt liquors, and wines. For these purposes many tons weight are annually exported from Russia to all parts of Europe and the United States. Cider too, is best clarified by Isinglass; the process shall be given hereafter.

CAVIAR.

THE roes of sturgeon might also be profitably applied to the making of *caviar*, which is a favourite food in Russia, and a very important staple article of export.

The best caviar is made from several kinds of sturgeons, the sevruga, and belugas, &c. The two latter are not found in the United States. Much of the caviar of Russia goes to Italy, and some to England. In some years the amount is from 15,000 to 20,000 poods.* The best sort, or grained caviar, is made in the following manner, according to Tooke. The cleansed roes are salted in long troughs, with eight or ten pounds of salt to the pood, well mixed by shovelling it over and over, then put by portions into sieves or thick nets stretched out, to drain and to coagulate, on which it is immediately pressed into casks. The cleanest and best sort is that which to appearance consists entirely of the eggs of the roes, and does not easily become fetid. The first thing to be done is to get ready a strong brine, then long narrow bags of strong linen: these are half filled with fresh roes, and filled to the top by pouring in the brine. When the brine has oozed through, the bags hanging on transverse poles, are powerfully wrung with the hands one after another; and the

* A pood is 36 lbs. English. EDIT.

roes, after drying for ten or twelve hours in the bags, are put into small casks.

Caviar is also prepared by taking all the nerves or strings out of the spawn, washing it in wine vinegar, or spreading it on a table; then salting and pressing it in a bag; after which it is put into a vessel perforated at the bottom, to allow the moisture to run out if any should remain. It somewhat resembles in taste the essence of anchovies. For an account of the value of caviar as an article of export, see Domestic Encyclopedia.

On the Encouragement given to the MANUFACTORY OF FINE CLOTH, by the Legislature of New-York, in a letter from R. R. Livingston, Esq.

Clermont, August 5, 1809.

SIR.

I have received your favour of the 20th July, and am much gratified to learn that the efforts of your society for the improvement of cattle are likely to be attended with success. This state affords some very fine descendants of Bakewell's stock, and we are beginning to give attention to their extension, particularly in the western part of it, where the pastures are very fine. I think with you, that the cattle of Europe do not degenerate here, except by neglect and not preserving the races pure—both of these evils will be remedied by the emulation which your society will excite. I am much pleased that you have found the samples of wool* worthy the attention of the Cattle Society. I am persuaded that its quality has improved under my care, though the original stock was of the finest that could be procured in Europe. The women, who are now spinning some of it, and who spun the fleeces of my full-bred sheep last year, declare that it is finer and better than it was; it certainly is more abundant. I am not surprised that your Merino wool has not yet found its price. When the supply is small and irregular, the manufactures do not pre-

* Mr. L. had sent to the Editor, two samples of his full-blooded Merino ram's wool, which were exhibited at the Cattle show, in July last.

pare the machinery necessary for its manipulation, and private families, not being in the habit of working it, do not know how to wash or card it. The same process that is used for common wool, runs it into knots and spoils it entirely. The first fleeces I sold was in 1806, for till I returned from France in 1805, the sheep I sent over three years before, were neglected, and did not increase; it then fetched only one dollar for the full-bred, and sixty cents for the rest of the flock, consisting of $\frac{3}{4}$ and $\frac{1}{4}$ bred sheep, and even then I gave a year's credit. There was then no carding mill at which it could be carded. My flock and their descendants have produced two mills with fine cards, and a third is now erecting, and my instructions have enabled private families to wash and card it with cotton cards, and in consequence of this, the wool has reached the prices I have mentioned, and instead of a year's credit to the manufacturers, they pay one half the price down, and the residue in eight months. When as matter of favour, I have spared small quantities to private families, as twenty or thirty pounds, they pay down the price, and some have even advanced the money to my overseer three months before the sheep were shorn, in order to secure a preference.

It may be useful to mention to you one great cause of the anxiety to have fine wool, which is now diffusing throughout this state. Our legislature have, very wisely, given a bounty of eighty dollars for the best specimens of woollen cloth, not less than thirty yards narrow cloth, wove in private families, and a higher bounty for two hundred yards made by professed manufacturers. The candidates in each county exhibit their cloth to the county court at their autumn sessions. The person to whom the prize is adjudged, has an order upon the county treasurer for the amount. The judges transmit a half of a yard of the cloth, with their certificate of the breadth and length of the piece to the society for useful arts, who determine which of the specimens sent them are the first, second and third best of the private claimants, and which the first and second best of those exhibited by professed manufacturers: the first in each line receives from the state treasury a piece of plate of the value of one hundred and sixty dollars, the second of one hundred dollars, and the third of eighty dollars, in addition to the

county bounty. The last year, the first prize for domestic manufactured cloth was adjudged to that made from my $\frac{3}{4}$ bred wool—that of the first quality was manufactured for my own use, and not exhibited for the prize, not having the necessary breadth. The first manufacturer's prize was taken by one to whom I sold my half-bred wool, and all the state prizes have been, I believe, adjudged to cloth made from half-bred Merino fleeces. This has opened the eyes of the public to this object, and excited so great an emulation among the farmers, that many are anxious to procure the wool, and I do not doubt, that at least one hundred pieces of cloth will be offered for the premiums this year.

I have had it very much at heart to render this breed of sheep common, and have accordingly published in the newspapers, in a plain stile, several little essays on the subject, which have had all the effect I promised myself from them in this state, and the western parts of Massachusetts, beyond which they did not reach. Having (as I believe) been the first to introduce the Merino full-bred into the United States, (mine having been sent from France in the spring of 1802, about three or four months before those of col. Humphreys were sent from Spain) I feel a great interest in seeing my fellow citizens avail themselves of the advantages they present, and the rather, as they are a more hardy and thrifty race than our own, as is acknowledged by every person who sees my mixed flock of common and Merino sheep feeding together, either on dry food or on grass. If, therefore, you conceive that any thing I have communicated may contribute to this desirable end, you are perfectly at liberty to use it as you think proper. I am sorry that it is not in my power to furnish the gentleman you mention with a full-bred ewe, as my whole stock of the full-bred ewes at present is only twenty, and I have it in contemplation to extend my flock to about 1000 sheep. At present, including lambs, it does not amount to four hundred of the full and mixed breeds; but I am now in such a train that I shall advance very rapidly. * * * * *

I am, sir, with esteem,

Your most obdt. humb. serv't.

ROBT. R. LIVINGSTON.

James Mease, M. D.

REMARKS.

The foregoing letter is published in the hope that the wise example exhibited by the state of New-York, will be followed by every state in the Union, and especially by our own, the soils and climates of which, as has been amply proved, are admirably calculated for raising sheep, and the improvement of wool. It cannot be denied, that whatever may be the aggregate amount of individual or domestic labour, in that and other articles in our state, (and it is certainly great) Pennsylvania is far behind New-York, Massachusetts or Connecticut, in the spirit for the propagation of Merino sheep, or for manufacturing cloths: not one complete establishment to any extent, existing in the whole state. Hitherto indeed so far from encouragement being given to improvers of wool, there has been a total indifference thereto by our legislature, which although composed of more than three-fourths farmers, declined until lately to do any thing on the subject; even to afford negative aid, by a trifling tax on those worthless animals about a farm,—DOGS: the whole proceeds of which, even now, in the township, in Delaware county, in which the writer's farm is situated, would not amount to a sum, equal to what he thinks some of his half-blooded Merinos are fairly worth. What remuneration might be expected, if a full blooded ram, or even one of the fourth cross were sacrificed by a cur or hound? It is to be hoped that the hint will be taken, and that every possible encouragement to the increase of our flocks, and to the extension of woollen manufactures will be afforded without delay. A small portion of the wealth of the people, cannot be distributed by their representatives, to greater profit for those from whom it is collected, than by stimulating them by premiums, to attend to an object so important as that under consideration, and by aiding and fostering the endeavours of those who have turned the public attention to this GREAT SOURCE OF AGRICULTURAL RICHES, and PUBLIC PROSPERITY.

ON THE DISTILLATION OF GIN IN HOLLAND.

Some years since, in consequence of the evasions of the duty upon home distilled spirits, which were practised in England, but particularly in Scotland, the British parliament instituted an inquiry into the subject, and several interesting reports by committees of the house of commons, and other publications were in consequence made. The following paper on the subject, by Mr. E. G. J. Crookens, a Dutch distiller, but resident in England, was written at the request of the committee of the house, and details several particulars, from which, it is hoped, the distillers of the United States may derive some useful hints. The author, however, acknowledges, that he has "omitted some *peculiar manipulations*, which have no influence upon the public welfare, and which can merely serve the private purposes of distillers."

IN order to answer the questions relative to the purity and goodness of the spirit distilled from grain, I shall chiefly confine myself to that which is distilled in Holland, and so much esteemed in this country, on account of its flavour as well of its purity and salubrity; because the nature of this spirit or geneva, and the method of distilling it, from the first beginning to the last stage of rectification, is better understood by me than the spirit distilled in this country, and the manner of distilling it. If you consider the humidity of the air in Holland, and the influence which this unhealthy air must naturally possess upon the health of the inhabitants, and that not only all the physicians, but also the people at large, are convinced that the spirit drawn from grain, or geneva, as it is there distilled, if drunk with moderation, is an universal preservative against the infirmities and epidemical diseases, which this damp air must naturally produce, it cannot be a matter of surprise that the use of geneva is so universal throughout Holland, and that the Dutch nation has carried the art of distilling it to a degree of perfection which it has not yet been possible to attain in any other country. To form a judgment on the beneficial nature of this spirit, I shall only quote this one fact, averred by daily example, and which has certainly not escaped the notice of English travellers who have traversed Holland, or resided there some time with a spirit of observation, viz. that numbers of persons are found much advanced in years who since their youth have made considerable debauches in this spirit, while

all those who commit similar excesses in foreign spirits succumb and perish in the bloom of life; and this observation leads me naturally to this question, Wherein does that beneficial virtue of the Dutch geneva consist, which it enjoys in preference to all other spirits? The answer to this question must be found in the sort of grain, in the good quality of each sort, in the manner of proceeding and drawing from it a spirit which is pure, and unmixed with any heterogeneous matter which might impair its natural goodness. An explanation of these points will contain, I think, the answer to the principal question respecting the manner of improving and meliorating the distilleries in this country.

I am perfectly aware that, treating on these particulars, I shall not be able to explain myself in a language which is not my native speech, with that purity and precision which the importance of the subject requires; but I shall endeavour to supply this deficiency by that veracity and frankness which may naturally be expected from a man who is not in the least connected with the distillers in this country, nor any wise personally interested in concealing or altering facts, and who in this business looks out for no other reward but the pleasure and satisfaction of being able to contribute his mite to the public welfare, and to the preservation of the health of so many millions of people, who may suffer either from the ignorance or avarice of the distillers,—reserving to myself only some peculiar manipulations, which have no influence on the public welfare, and which can merely serve the private purpose of distillers, who use and put them in practice.

On entering upon this subject I shall have no occasion to enlarge on the quality of the grain, it being universally known, that in order to produce a spirit which is pure, and of a pleasant flavour, grain must be used which is pure, and not spoiled by wet either in the field or the granaries. I shall therefore confine my observations on the species of grain, and observe in this respect, that the Dutch distillers are perfectly acquainted with the manner of drawing spirits from the malt of barley, as well as from unmalted barley with a portion of malt added to it, in the proportion of a third or fourth part; and there are several petty distillers in that country who still make use of that grain on account

of its low price; all great distillers in Holland are convinced that malt yields not only a purer spirit, but also a greater quantity than raw barley mixed with malt, contrary to the general opinion of the distillers in this country. The artificial vegetation which the grain undergoes, disengages the saccharine matter, and renders it more proper to be extracted by the water; nay it augments the saccharine matter contained in the grain. To be convinced of the truth of this remark, we have only to examine the malt from time to time during the operation, and we shall find that this matter develops itself more and more as the grain grows longer; yet this vegetation should be stopped as soon as this matter is disengaged from the length of the grain, otherwise the saccharine part will be lost; and if it be stopped too soon, when this matter has only disengaged itself from half the length of the grain, as is done by several brewers in Holland, all the saccharine matter contained in the grain not being disengaged, it cannot be so easily dissolved in the water. I am convinced by several experiments, which I have made myself on several sorts of malt, and in different degrees of perfection, that about a fourth part more spirits is obtained from malt, which is perfectly well made, than from that in which the vegetation has been checked too soon or carried to excess. The manner of drying it is also an article of equal importance; and, in general, malt dried too quick, and by an unequal heat, yields not as much spirit, nor a spirit of as pleasant a taste, as malt dried in an equal and slow manner. If it be considered that the saccharine matter of the grain produces alone and exclusively the spirit, it will be easily conceived that malt of barley must yield more spirit, and of a more pleasant taste, in proportion as the saccharine matter is developed in the malt, and rendered more proper to be extracted and dissolved by water, than in unmalted or raw grain, where this matter is united and combined with the other particles of the grain; and if some distillers in this country are of opinion that raw barley, mixed with a certain quantity of malt, produces somewhat more spirit, they must necessarily have made their experiments with malt which had not attained the last degree of perfection. I rather incline to think that the distillers in this country prefer raw grain for the same

reason it is preferred in Holland, namely, because it neither costs so much trouble nor expense, and that the result depends not on as many little circumstances and precautions.

In Holland barley is but very seldom made use of, notwithstanding the purity of the spirit which it yields, as it has been found out that barley yields but little spirit compared with other grain: for this reason other species of grain have been substituted in its place, which yield a more considerable profit, while at the same time the spirit they give is by no means inferior, from the precautions attended to in the operation.

Wheat mixed with a portion of barley malt, in the above mentioned proportion, yields more spirit than barley, and of a vinosity and fineness of taste which exceed all belief; and the distillers in Holland, who wish to produce a very fine geneva, make use of wheat, and sell this spirit to private persons, who desire to have it, at double the price of common geneva; and if the fermentation and distillation be conducted with prudence, a spirit may be drawn from it which equals the spirit of wine in vinosity and flavour. I have known a distiller in Rotterdam who sold his spirit drawn from wheat for true French spirit of wine; and in order to give it this flavour, he made the grain ferment with the dried lees of wine, which he procured from France, instead of barm; the lees of wine having this advantage, that they procure a slow fermentation, and, as they contain a considerable quantity of essential oil of wine, they communicate to the spirit the flavour of the wine from which they are taken. In Westphalia, and throughout the whole circle of Lower Saxony, no spirit of wine is to be found any ways passable, although the distillers follow the process observed in Holland in regard to the composition, without acting upon the principles of the Dutch distillers with respect to the fermentation and distillation, excepting the bishopric of Hildersheim and its environs, where the distillers make use only of raw wheat mixed with a small portion of malt; and this proves the superiority of wheat above all other species of grain.

Notwithstanding all these advantages, wheat is not made use of in Holland for common or general use, as experience has proved that rye, which in ordinary times is much cheaper than wheat, gives

nearly a third more spirit than wheat, and that by the way of proceeding they have attained the art of drawing from it a vinous and pleasant spirit, and in point of salubrity by no means inferior to that drawn from barley or wheat, nay, perhaps superior in this respect to the two others. Previously to my entering upon a minute account of the distillation made use of and practised in Holland, I ought to observe, that it must not be supposed that all the distillers scattered through that country are able to make good spirits. You find, on the contrary, in many places very bad geneva; it is only the great distillers in Schiedam, Welsep, Rotterdam, and in general the distillers in the province of Gueldres, who are capable of delivering the spirit, which is so much sought after and valued in foreign countries, while petty distillers, though they follow the same method, but not to the same perfection, from want of a knowledge of the first principles, and of a good theory of the art of distillation, fail in their object; and it is for this reason that the servants and workmen who were procured in England from the distilleries in Holland, have never been able to succeed in producing a spirit of the same good quality as their ancient masters made in Holland. In Holland are also found unprincipled distillers, who, making use of spoiled grain, have recourse to the pernicious additions to cover the bad taste and flavour of their spirit; but fortunately the palate of the people is so accustomed to a pure spirit, that this pernicious geneva cannot be sold in the interior, but is for the most part exported to the two Indies, Africa, and other countries.

Commonly three sorts of spirit are made: one which requires to be rectified over juniper berries for the use of the interior, which is in some degree weaker than that exported for England, because in Holland it is not usual to mix it with water, but to drink it pure; another for being exported to England, also rectified over a small quantity of juniper berries, but some degree stronger; and a third sort, rectified to the same degree of strength, but without the addition of juniper berries, for exportation to America, because the North Americans do not like that flavour, but prefer the spirit quite pure, without any addition which may give a peculiar taste.

There are two principal processes:—The major part of the distillers take a quantity of flour of rye, ground rather grossly, mixed with a third or fourth part of barley malt, proportionate to the size of the tub in which the vinous fermentation is to be effected. They begin by mixing it with cold water; this mixture is much stirred with the hand to prevent the flour from gathering into lumps, and that it may be evenly divided. When this point is attained, water is added to the mass, which water must have been heated to the degree of the warmth of human blood: the whole must be well stirred, in order to divide the grain in an even manner; after which the ferment is mixed with this wash, after it has been previously well diluted with a little of the liquid. Great attention should be paid to the tub being kept in a moderate degree of warmth, fit for the intended fermentation, by giving the air some access to the liquid, and by preventing the rays of the sun from falling on the tub in summer, and by procuring a current of fresh air for the laboratory: the fermentation generally begins in this case six hours after; should it be sooner, it is judged that the fermentation will be too strong, and means are employed to check it: if it does not commence soon enough, proper means are made use of to accelerate it: if the fermentation be well conducted, it generally terminates the third day, and the liquor grows very transparent, and assumes an acrid taste, hot and biting on the tongue. When it has attained this point, the wort is well stirred, and the mash, with all the corn, is put into the caldron; and hereupon they proceed to the first distillation, which is conducted very slowly. Great attention should be paid, that the mash be taken exactly at that time, before the acetous fermentation, which destroys the spirit, can begin. The slowness of the first distillation is a point of the utmost importance; because, if you proceed rapidly, the essential oil goes over with the spirit, and mixes with it so intimately, giving it at the same time an unpleasant taste of corn, that it is impossible to separate it from the spirit, or to destroy this taste, but by pernicious additions hurtful to health: thus, then, the success in obtaining a good spirit chiefly depends on the first distillation. Hereupon the liquor is rectified over juniper berries once or twice, according to the

sort of spirit which it is intended to produce. Some distillers mix their juniper berries immediately with their wort, and cause the whole to ferment together; but in this case they can only draw from it a spirit for the use of the interior, or, for exportation to England; for this reason they are generally only made use of at the rectification. In the before-mentioned case, and method of operating, I would however recommend the addition thereof previous to the fermentation, because the juniper berries by their aromatic virtues augment the spirit a little if the fermentation be conducted in a proper manner, as will be seen in the sequel.

The second method observed by the best distillers is as follows:—You take the malt and rye in the given proportion, and further some warm water, heated to a certain degree of warmth; you mix the corn grossly ground, with this water, stirring and working it well, until the whole be well mixed and evenly divided; then let the wash rest some time, until the meal has settled at the bottom; hereupon let the liquid matter flow into the fermenting tub, and recommence the same operation with another quantity of water poured upon the same corn, and repeat these operations until you are convinced that the water thus drawn from the corn at different times has dissolved the whole saccharine matter contained in the meal; put this water into the fermenting tub, and as soon as the warmth is diminished somewhat under the temperature of the blood, add the ferment. The fermentation does not begin so soon as in the first method, but is more regular and slow. Other distillers, who observe the same method, pour all the water which they intend to make use of, in order to have a well diluted wort, and of an equal degree of heat, at once in a tub, and put their meal gently and slowly into this whole mass of water, while one or two persons are quickly stirring the mixture with sticks made expressly for that purpose, in order evenly to divide the meal, and to prevent it from gathering into lumps. When the whole is well mixed they proceed, as mentioned in the preceding article, by drawing off the liquid from the grosser matter, &c. &c.

This method is not entirely to be rejected, because the water has thus a more free access to every part of the corn, and for

this reason can more easily extract the saccharine matter. After the fermentation is finished, and the liquid has become very transparent, and assumed the hot and biting taste, you proceed to the aforementioned slow distillation.

In all these cases the water for making the wort must be more heated in winter than in summer; and when the weather is uncommonly hot, you should cool the liquid with cold water, and at the same time add to it a little fresh flour; and by this means you obtain a slow and almost imperceptible vinous fermentation, which is a very important point in regard to the quality as well as the quantity of spirit.

The water which is made use of is also deserving the utmost attention. Hard water, and which is loaded with many particles, produces less spirit, and of a harsh and hard quality. In Holland they make use of the water of the Meuse, and keep vessels expressly for that purpose, which load the water in that river, and convey it to the laboratory of the distillers. In other places they take the water of small brooks, where the water flows over a sandy ground, and they take care to make a provision of it when the weather is still and calm, and not immediately after a heavy fall of rain, by which the water might have been muddy. They who have adopted the first method are of opinion, that by this operation, and by distilling the whole mass at once, they obtain a greater quantity of spirit, and that they have less trouble in making the composition. In this they are, however, grossly mistaken. The great many experiments I have made in Holland with either method, and which two years ago I repeated in the electorate of Hanover, at a distiller's of my acquaintance, have confirmed me in the opinion, that by this method no greater quantity is obtained, and that the spirit, *ceteris paribus*, is less pleasant and of a harsher taste, for this evident reason, that with the greatest precaution it is hardly possible to prevent the thick mass, exposed to the immediate action of the fire, from communicating to the liquor an empyreumatic taste; and it is by no means improbable, that previously to the fermentation, all the essential oil not having been set a liberty, a part of it has remained united and incorporated with the flour, or at least with the husks of the grain, and

only disengages itself by the aid of the heat during the fermentation and distillation ; so that, following this method, you are in danger of causing a large quantity of essential oil to go over with the spirit. This method has also the inconvenience attending it, that you are obliged to leave the caldron open till the liquid begins to boil, and that in the mean time a man must continually stir this mass with a stick to prevent it from sticking to the bottom of the caldron, and being burnt, until the liquor begins to boil up: at this time the greatest danger is over, and the lid is put on. Thus nothing is gained in point of trouble, because, in following the other method, you proceed immediately to the distillation. Among the advantages which the dilution of the mash, together with the slow fermentation and distillation, communicates to the spirit distilled in Holland, both in point of flavour and salubrity, must also be counted, that the best distillers know how to extract from this mash all the ferment, by which means the spirit is rendered more pure ; because the ferment, of whatever nature it may be, contains most of the essential oil of the matter whence it is taken, and that by this method the greatest part of this oil is taken from the liquor before the distillation, while at the same time they derive from it this profit, that they never have occasion to buy their ferment from the brewers, but on the contrary sell, themselves, a considerable quantity of it, after having dried the same in the shape of loaves, in which state they preserve it for years, if it be kept in dry places ; and in this state it is much sought after by bakers as well as by private families, because this dry ferment, which is diluted with a little water, never communicates to the bread or pastry the bitter taste which barm does, loaded as it is with the bitter particles of the hops. The distillers, who are acquainted with this method, enjoy the additional advantage, that they can continue to distil during the summer, and at such times when barm or yeast is extremely scarce. The profit which they obtain from this ferment is one of the reasons of the low price of the Dutch geneva, compared with the price of spirits distilled in other countries ; but as they who are perfectly initiated in this art keep it a secret, I shall not explain at present the manner in which they

proceed, from the motives which I have assigned at the beginning.

And as the Dutch distillers are under no sort of constraint in their operations, nor have the least reason to hurry them, they take the greatest care to clean after each operation their caldron, and above all their tubs, in which the vinous fermentation is effected; and they never fill them again, but after having thoroughly cleared them from the ferment, which sticks to the sides of the tubs, from the last fermentation, because they know from experience, that the least remains of this matter gives the following liquor a bad taste; for this purpose they clean them with lime water, and never with soap, because the caustic alkali contained in the soap would not fail to give the liquor an urinous taste.

As the Dutch distillers are thoroughly convinced that the success of their operations depends on a slow distillation, they take particular care to have their fire-places constructed in such a manner, that the distiller may have it entirely in his power to abate or accelerate the action of the fire at every moment when he shall think it necessary. It is impossible to fix upon a peculiar form to serve in all cases, as it must naturally vary according to the form of the vessel; but they never lose sight of the following general rules: viz. 1st, That the place which contains the fire must be contrived in such a manner, that the action of the fire operates equally on the whole surface of the bottom of the caldron without being concentrated to one point, where the caldron would be burnt, and unavoidably and immediately communicate to the liquor an empyreumatic taste: by this equal action of the fire, the liquor is heated in a more equal manner, and by a moderate fire; and also quicker than if the fire acted only upon one point. 2dly, That the openings of the fire-places be iron doors, in which are made several small holes, which can be opened and shut, as occasion may be, to accelerate or check the current of air. 3dly, That the chimney be furnished with an iron plate, or damper, placed horizontally, by which the diameter of the chimney can be diminished as often and as much as the distiller chooses, who by this means moderates at pleasure the action of

the fire, and can even stifle it at once, by shutting the openings in the fire-place, and the passage of the smoke into the chimney.

As the vinous fermentation is a point no less important, and one of the principal requisites on which depends the success of the operation, and as this fermentation can only be conducted slowly in a moderate temperature, they take great care that the laboratories, in which the vinous fermentation is effected, be constructed on such principles that the rays of the sun can be prevented from acting upon the tubs containing the liquor subjected to fermentation, by means of windows with shutters made every where opposite to each other, that in extraordinary hot weather a current of fresh air may be obtained to cool the laboratory. The floor is paved with stones, on which from time to time fresh water can be poured, which cools considerably the temperature of the atmosphere in the laboratory; and in winter it can be warmed by means of one or more iron stoves, or, which is perhaps still better, a delft stove, which is made use of in several places in Germany, which are of a more equal, more moderate, and less stifling heat.

It must not be supposed that the distillers in Holland make use of a small quantity of malt, from a persuasion that no Geneva can be obtained from the flour of rye, or any other grain, without that addition; the contrary is the truth: I have made several experiments with rye, without the least addition of malt; and I have always obtained the same quantity of spirit, but it was never of so pleasant a taste. This addition is only necessary inasmuch as it assists the fermentation; and that if it be used there is no occasion for so much ferment, and of consequence not so much essential oil is introduced into the liquor, which is the reason that the spirit is of a more pleasant flavour, and not so harsh as that which is made of rye, or any other flour. I must add in this place, that the Dutch distillers are extremely careful to make use only of such rye as is grown on a calcareous or sandy soil, and never employ, if they can possibly avoid it, any corn produced by a fat, clayey ground; and this is the reason why they make use of rye imported from Prussia, grown on a poor soil, and which, according to common report, is dried in kilns before

it is exported, and on this account is known in Holland by the name of dried rye ; the grain is small, and very hard and dry ; because this rye produces more spirit and of a superior quality to that which is drawn from the rye grown on a clayey soil, and because it contains less oily particles.

On comparing the process of the Dutch distillers with that followed in this country, it will be obvious, at first view, why the spirit, which is distilled, does not possess the perfection of Dutch geneva, either in regard to the flavour or salubrity ; and all the questions to be proposed on this subject may be easily answered, from a mature consideration of the difference of these processes ; and the prejudice entertained by many persons in this country as well as in Germany, that no spirit of the same quality can be produced in any other country, deserves only to be laughed at. These persons do not consider that geneva is a product of art, which neither depends on the oil nor on the climate of a country as wine does, and that if you employ the same materials, and observe the same process, the result must necessarily be the same ; nor is it less evident, that as long as the distillation shall be effected on the principles hitherto observed in England, the perfection of Dutch geneva can here never be obtained. In order to obtain it, government must necessarily cooperate, by giving the distillers full liberty to act and proceed according to their knowledge and experience ; and I may hazard, without the least danger, the assertion, that as long as the duty is laid either on the quantity of the wash, or on the capacity of the still, the above can never be attained, and the distillers to avoid their ruin will be obliged to have recourse to pernicious ingredients. In the former case, their interests prompts them to overload their liquids with too great a quantity of grain, which not only causes them to sustain a considerable loss of spirit, because the water, which acts as a solvent to saccharine matter, can only dissolve and keep in a state of solution a certain quantity of that matter ; but after it is saturated, the rest of that matter is lost. It further results from thence, that the fermentation, on which the success of the operation chiefly depends, proceeds not as regularly as in regard to a well diluted wash ; and on distilling this thick, and as it were

over-saturated wash, the distiller introduces into his caldron a great quantity of oleaginous particles, and of consequence into his spirit more essential oil, especially if the distillation be pushed on with vivacity; besides that this thick wash, from the rapidity of the distillation, is likely to communicate to the spirit an empyreumatic taste, which would obstruct its sale if the rectifier did not correct this fault by noxious additions.

In the latter case, the interest of the distiller demands that he must conduct the distillation rapidly, and with a violent fire; the result of which is, that all the essential oil rises with the spirit, and that it also must contract an empyreumatic taste. It further results from this rapid mode of working, that the distiller does not allow himself sufficient time entirely to empty his caldron, or to clean it carefully, as well as the other utensils; which in my judgment must have a strong influence on the salubrity of the spirit on account of the verdigris, which, from want of cleanness, forms itself into the caldron and worm, if they are made of copper; and as the distillations succeed each other in so rapid a manner, the distiller cannot allow the liquor sufficient time to ferment slowly; he must therefore make use of more ferment, which cannot but produce a bad effect, both in regard to flavour and salubrity. They who assert that a rapid distillation has no influence upon the taste and flavour of the spirit, either try to deceive, or are ignorant of the first principles of the art of distillation; and in order to confound them, we have only to ask this question, Why are we obliged to distil fine and delicate liquors in *balneo maria* (a bath of water) to give them that fine flavour which causes them to be so much esteemed? The answer is, because in this case, the action of the fire is not immediately directed against the vessel which contains the liquor, and because the heat is equal and uniform, and cannot be increased by the vivacity of the fire, because water which is in a state of ebullition cannot assume a higher degree of heat, and thus the liquors cannot contract any empyreumatic taste. If the fire had not any influence upon the spirit, these precautions would certainly be fruitless.

Persons who are of opinion that a rapid distillation has no influence upon the salubrity of the spirit, are equally mistaken. No one endowed with common sense, and possessed of the least know-

ledge of the art of distillation, can call it in question, that by a violent fire all the essential oil must be made to rise with the spirit, and the fiery and indigestible qualities of this oil, so copiously mixed with this spirit, are too well known to admit of the least doubt. They not only possess the property of intoxicating quickly, and causing head-ache, but also effect so very strongly the nervous system, as to cause a trembling when taken in any excessive degree ; and in general it may be fairly asserted, that adulterated spirits possess the quality, in common with bad wine, of causing head-ache and trembling when drunk in an extravagant manner ; which is not the case after an excess committed in drinking good and pure wine : and I rather incline to think, that by this rapid distillation some particles of copper are disengaged, and rise and mix with the spirit, because the wash contains some small quantity of acids, which with the aid of an excessive heat acts upon the metal, as all other acid solvents do upon metals in proportion as they are assisted by heat ; and this is perhaps the reason of the blueish colours discernible in spirit distilled by a violent fire.

But supposing that a rapid distillation cannot produce any effects hurtful to health, *per se*, it is at least self-evident it is excessively pernicious in its consequences, because the rectifier is absolutely obliged to employ poisonous ingredients for the purpose of destroying the empyreumatic and unpleasant taste, which the essential oil has communicated to the liquor ; and which simple rectifications, however multiplied, cannot by any means effect.

Before I explain these means it will be necessary to observe, that unprincipled distillers, in employing these means, have two different objects in view ; namely, to destroy the bad taste of the spirit ; and, secondly, to increase the quantity of spirituous matter, and thus to procure by those additions a greater quantity of spirit from a given quantity of wash than they could obtain by a natural process.

To obtain the former object the distillers make use of pure alkali, caustic alkali, and Glauber's salt, which possess a peculiar quality to absorb the essential oil ; but on the other hand, they communicate to the spirit their most volatile particles, which their great volatility renders extremely pernicious, and also impart to the liquor an extremely urinous taste, not less unpleasant ; in or-

der to destroy which taste, they are obliged to make at the same time use of acids, such as the sulphuric, muriatic, and nitric acids: others employ the crystals of verdigris, or radical vinegar (acetous acid) distilled from crystals of verdigris; or the acid from iron or copper vitriol. These ingredients destroy, in some measure, the bad taste, without increasing the quantity of spirit: for the purpose of attaining the latter end, they have recourse to oleaginous aromatics in general and vegetable oils, which possess an uncommon power to augment the quantity of spirit; but to produce this effect they must be mixed with the liquor before the fermentation: for this purpose they are triturated with a little sugar in a mortar, and by this means they would considerably retard the fermentation; but the use thereof, in order to derive from them all possible profit, requires a peculiar mode of conducting the vinous fermentation. When the distillers wish to give their spirits a vinous taste, they digest strong nitric acid with alcohol for some time, and distil it afterwards, which produces a dulcified nitrous acid, and mix a little of this acid with their spirit, which gives it a flavour resembling that of French spirit of wine.

These are the principal means which the distillers generally make use of: they are very seldom employed in Holland, and by no means necessary for the interest of the distiller. Their mode of proceeding yields spirit of a pleasant and agreeable flavour, and in great quantity; and no artifice can ever equal the taste and flavour which a slow operation, in every stage and part of the process, naturally imparts to the spirit. I must suppose that these practices are more common, if not generally resorted to, in this country; but as chemistry furnishes a great many simple means to discover the alkali and acids in the liquor, the officer whom government employs for the purpose cannot but find it a very easy task to detect the fraud; for example, solutions of bodies precipitated by alkalis, such as vitriol of iron, but chiefly alum mixed with small quantities with a little of this spirit, will immediately show the presence of alkalis by a precipitate, and the change which acids produce in blue vegetable colours will prove their presence. A bit of paper tinged with litmus put into the

spirit, tincture or syrup of violets, into which are poured a few drops of the spirit, manifest immediately the presence of these acids. Severe punishments inflicted on these fraudulent distillers, who sacrifice to their avarice the health of their fellow-citizens, will go a great way in preventing these frauds; and they would doubtless cease entirely if the duty were laid on the product of the labour of the distillers, that is, on the spirit, or to be paid immediately from the malt or corn, as is done in Bremen, where the distiller pays the duty at the mill, to which he carries his corn to be ground for the use of his distillery, and thus is exempt from all constraint during the whole course of the operation.

The only point which I have yet to consider is, whether there does not exist a method to accelerate considerably the distillation without running any danger of experiencing these bad effects. To this I cannot but answer in the affirmative: you have only to substitute shallow caldrons in the room of deep ones; their diameter must be larger, and they must have a concave bottom. I have made several experiments with a caldron constructed in this manner, and the result was always a purer spirit, and in a greater quantity, with a saving of ten-twelfths of fuel. The reason is this, that a large surface of liquor being exposed to heat, the liquor is heated in a more speedy and even manner in all its parts by a less brisk and strong fire, and evaporates with uncommon rapidity, and can neither contract an empyreumatic taste, nor can much essential oil rise and mix with the spirit, as the power of the fire must be greatly inferior to that which is employed under a common still, where the lower parts of the liquor experience a violent fire before the higher parts are sufficiently heated, and wherein the liquor continues a longer time exposed to the action of the fire, in proportion as the evaporation proceeds more slowly; and this diminution of heat is perhaps the reason why more spirit is obtained, because some part of the finest spirit cannot fail to evaporate when the distillation must be pushed on by a brisker fire; but in this case it is unavoidably necessary that the fire-place be constructed on the principle above described. For the same reasons it is obvious, that it is very profitable to effect the distillation in small caldrons, especially if they are of the

common cylindric form, both in regard to the quantity and quality of the spirit, and also with respect to the fuel: you will not, for instance, draw so good a spirit, and the same quantity, in a caldron of eighty gallons, as in two of forty each; the latter will be emptied twice, and oftener, in the same time which is necessary to empty the large caldron once, and with less fuel, and thus the produce of these two small caldrons will be double of that of a large one in a given time. Before I conclude I must make this observation, that it is extremely easy to make the spirit appear less strong at the proof with the hydrometer. All bodies which are easily dissolved in spirits, and augment their specific gravity, produce that effect; and the sulphurous acid possesses the property in a peculiar degree. Before you subject the spirit to the proof with the hydrometer, you should endeavour to discover the presence of this acid by the proofs above mentioned; and every distiller of fine liquors knows perfectly well, that as soon as he mixes a little sugar with his liquor to sweeten it, the hydrometer loses its effect; but it is extremely difficult to make it appear stronger than it actually is at the proof with the hydrometer. This end cannot be attained but by mixing it with bodies of less specific gravity, such as ether, which, on account of its high price, will not be made use of. I say, at the proof with the hydrometer; for this is widely different from the phial proof, because, on mixing a little oil with spirit, so much diluted by water that no more bubbles appear, they may be immediately made to reappear. The petty innkeepers in Holland are extremely expert in this trick; they commonly employ oil of olives, poppies, nuts, or almonds, and in general all sorts of oils, which do not give the spirit a bad taste. These frauds are discovered by diluting these spirits with a great quantity of water, when the oil immediately appears on the surface of the liquid. Before I conclude, I shall here touch upon the question, Whether the residue of the distillation can serve to nourish and fatten cattle? On analysing corn, we find that it consists of an earthy or mucilaginous and a saccharine matter, and of oil and salt. If we further consider, what I have already frequently mentioned, that the saccharine matter, which exclusively yields the brandy, and that the mucilaginous and earthy matter, together with the salt, remain untouched in the

residue, it will not be doubted that this mucilage with the salt cannot but be very nourishing. Experience has proved, in Holland, that this residue, which is there called *toefol-drank*, possesses very nutritious virtues; the number of pigs which the distillers yearly draw from Westphalia exceeding all belief. They are fattened in a very short time for the use of the navy and merchants, who employ them on board ships for the subsistence of the seamen, who are not supplied there with beef as they are in this kingdom: while other distillers fatten with this residue bullocks and cows; and it is a circumstance worthy of notice, that cows fed with this residue give a considerable quantity of milk. It is thus that the Dutch distiller draws some profit from every thing; nothing is lost with him, and this economy is in general the cause of the low price of geneva.

REMARKS.

Mr. Crookens appears to be ignorant of the utility of charcoal in depriving still burnt liquor of *empyreuma*, and supposes that this is only to be done by noxious ingredients; and as he declines to detail the mode pursued by the Dutch distillers in procuring and preserving their ferments, under the pretence that it is not necessary to the elucidation of the question before him, (although it is clear, that if any part of the process required explanation, that one did, upon which depends so much of the success of the whole operation,) the editor in order to supply the deficiency, has consulted another authority,* a practical distiller, whose work bears every mark of experience.

“By ferments, we mean any substance, which, being added to any rightly disposed fermentable liquor, will cause it to ferment much sooner and faster than it would of itself; and, consequently, render the operation shorter; in contradiction to those abusively called so, which only correct some fault in the liquor, or give it some flavour. Hence we see, that the principal use of ferments is to save time, and make dispatch in business; whilst they

* The Complete Distiller. By A. Cooper. London, 1830.

only occasionally, and, as it were by accident, give a flavour, and increase the quantity of spirit. And, accordingly, any fermentable liquor, may, without the addition of any ferment, by a proper management of heat alone, be brought to ferment, and even more perfectly, though much slower, than with their assistance.

These ferments are, in general, the flowers and faces of all fermentable liquors, generated and thrown to the surface, or deposited at the bottom, either during the act of fermentation, or after the operation is finished.

Two of these are procurable in large quantities, and at a small expense; we mean beer-yeast and wine-lees; a prudent and artificial management, or use of which, might render the business of distillation much more facile, certain and advantageous.

It has been esteemed very difficult, and a great discouragement in the business of distillation, to procure a sufficient stock of these materials, and preserve them at all times ready for use. The whole secret consists in dexterously freeing the matter from its superfluous moisture; because in its fluid state, it is subject to a farther fermentation, which is productive of corruption; in which state it becomes intolerable fœtid and cadaverous.

The method of exposing it to the air till it has acquired a proper consistence, is subject to great inconveniencies; and so peculiar and careful a management necessary, that it rarely succeeds.

The best way, therefore, is to press it very slowly and gradually, in a thick, close, and strong canvass bag, after the manner of wine-lees, by the tail-press, till it becomes a kind of cake; which, though soft, will easily snap, or break dry and brittle between the fingers. Being reduced to that consistence, and closely packed up in a tight cask, it will remain a long time uncorrupted, preserve its fragrancý, and consequently, fit to be used for fermenting the finest liquor.

The wash being brought to a tepid, or lukewarm state in the backs, a proper quantity of a good conditioned ferment is added; but if the ferment be solid, it should be previously broken into small pieces, and gently thinned either with the hand, whisp, &c. in a little of the tepid liquor. A complete and uniform solution, however, should not be attempted, because that would greatly

weaken the power of the ferment, or destroy its future efficacy. The intended quantity, therefore, being thus loosely mixed with a moderate parcel of the liquor, and kept in a tepid state, either by setting it near the fire, or otherwise, and free from the too rude commerce of the external air; more of the insensible warm liquor ought to be added, at proper intervals, till at length, the whole quantity is properly set to working together. And, thus, by dividing the business into parts, it may much more speedily and effectually be performed, than by attempting it all at once.

The whole quantity of liquor being thus set to work, secured in a proper degree of warmth, and defended from a too free intercourse of the external air, nature itself, as it were, finishes the process, and renders the liquor fit for the still.

Experience has demonstrated, that all ferments abound much more in essential oil, than the liquor which produced them: and consequently they retain, in a very high degree, the smell and flavour of the subject. It is therefore requisite, before the ferment is applied, to consider what flavour is intended to be introduced, or what species of ferment is most proper for the liquor.

The alteration thus caused by ferments is so considerable, as to render any neutral fermentable liquor of the same flavour with that which yielded the ferment. This observation is of much greater moment than will presently be conceived; for a new scene is hereby opened, both in the business of distillation, and others depending upon fermentation. It must, however, be observed, that its benefit does not extend to malt, treated in the common method; nor to any other subject but what affords a spirit tolerably pure and tasteless: For, otherwise, instead of producing a simple, pure, and uniform flavour, it causes a compound, mixed, and unnatural one. How far the fine stiller may profit by it, well deserves his attention; and whether our native cyder spirit, crab spirit, &c. which have very little flavour of their own, may not, by this artifice, be brought nearly, if not entirely, into the state of some foreign brandies, so highly esteemed, is recommended to experience."

Some little inconsistency is to be remarked in the paper by Mr. Crookens.—In one place he says, that a rapid distillation is

injurious to the salubrity and flavour of the spirit, p. 33 ; and in another, he allows that there are means to accelerate the distillation without experiencing those bad effects. The remedy is a still, differently formed from that in common use. Probably he means to apply the first remark only to deep stills. A very able distiller, Col. Alex. Anderson, of Philadelphia, whose improvements in the art have tended very much to increase the quality of our home liquor, is of opinion, "that the quality of the spirit is determined in the *act of fermentation* ; the form of the still having nothing to do therewith ; the act of distillation being a mere separation of the spirit and water ; hence those who can do most in a given time, at the least expense of fuel and labour, will succeed best."*

On the subject of the influence of the form of stills, upon the liquor distilled, the following remarks† of a late French writer, Mr. Curaudau, are highly worthy of attention.

"When Mr. Chaptal pointed out the fault of our common stills, and proposed to substitute for them broad and shallow alembics, I was one of the first to consider the reform as very useful, and at the same time highly conducive to the interest of the distiller. Accordingly, having had occasion to write on the same subject, I proved, that I coincided in opinion with Mr. Chaptal, by extolling the advantages, that shallow stills possessed over deep ones.

"Though I had no foundation for my opinion but theory, and the particulars advanced by Mr. Chaptal in support of the system he proposed, I was far from thinking that I should have to retract the assertions I had made, and that experience would destroy the plan of reform, the adoption of which I had sought to promote.

"However, as it is the duty of a man, who studies useful improvements in the arts, not to compromise the progress of science, or sacrifice to self-love whatever tends to correct the errors into which he may have fallen, I hasten to communicate to the

* Letter to Editor. For an account of Mr. A's improvements—see the *Domestic Encyclopedia*.

† Sonini's *Bibliothèque Physico-Economique*, 1808, tom. 1. p. 106.

physical and mathematical class of the Institute, the observations that have arisen from the objections made to me by those who have employed shallow stills.

“In deep stills, the liquor, at a certain time, receives more heat than it gives off by evaporation: the temperature then may rise, till it reaches the term at which the ebullition is complete, an essential condition for effecting the combination of the alcohol with the aroma of the wine, before it is separated from it.

“No doubt shallow stills greatly shorten the time of distillation; this is a fact, on which all distillers agree: but they say too, and this cannot be disputed, that the brandy obtained in this method contains nothing or next to nothing of that aroma, which is so grateful to the smell, and communicates the agreeable flavour, that distinguishes well made brandy.

“It is this difference in the quality of the products, that has engaged the attention of distillers. I thought at first, that they might have been deceived by their prejudices, and boldly disputed their opinion: but finding, that shallow alembics fell more and more into disrepute, I resolved to examine for myself, whether the objections made to them were well founded. What I thought it particularly necessary to ascertain was, whether the difference in flavour between brandies distilled in alembics of the different forms were sufficiently perceptible, to authorize the preference given to one over the other. Accordingly I subjected to distillation a quantity of wine, part in a shallow alembic, part in one of the common construction.

“When I had finished the distillation, I examined both sorts of brandy, and gave them to different persons to taste, all of whom, as well as myself, uniformly gave the preference to that produced from the deep still. Thus I was convinced, that the objections of the distillers were not the result of unfounded prejudice; and that the difference observed in the products of two analogous operations must depend on the circumstances of the evaporation; which were not the same in the two stills, since I satisfied myself, that, in the common still, the evaporation of the spirit does not begin to be very copious, till the heat is 70° or 75° of Reaumur (190° or 200° F.), while on the contrary in the shallow still it is very abundant from 45° to 55° (133° to 156° F.).

"This difference in the intensity of the heat produced, at the moment when the alcohol separates from the liquor that contains it, appeared to me worthy of remark, and tending to explain why the products must differ. In fact, is it not well known in chemistry, that wine distilled at the heat of a vapour bath yields a spirit much inferior in quality to that which is produced by distillation on a naked fire ?

"Experience proves then, that it is necessary to bring the wine to boil, before the alcohol is abstracted from it. This boiling favours the reaction of the principles of the wine, and is the cause of a new combination by their mutually acting upon each other, which renders the spirit more aromatic and highly flavoured, than that obtained from wine, to which a similar degree of heat has not been given.

"To explain why the liquor cannot be raised to the same degree of heat in a shallow still, as in a deep one, it is sufficient to observe, that, in the former, the evaporation always keep pace with the heat produced: in other words, if we increase the fire, we only accelerate the evaporation, without preceptibly increasing the temperature of the fluid.

"Hence it is evident, that shallow stills are far from being well adapted to attain this end; and the circumstance that is essential to fit them for a speedy evaporation, is here a defect, instead of an advantage, in proportion to its efficacy.

"From what has been said we may conclude :

"1. That shallow alembics, though very fit for the distillation of certain fermented liquors, may sometimes alter the quality of the products of distillation.

"2. That the inconveniences arising from the employment of shallow alembics in distilling wines, arise from the facility with which evaporation takes place in them.

"3. That a high temperature is always necessary, to carry over the peculiar aroma of the wine, and perhaps too that arising from the action of heat on the principles of the wine.

"4. That deep alembics ought to be preferred to shallow ones for the distillation of wine.

“Lastly, that the best dimensions for an alembic, without regard to its figure, must be such, that the surface of the liquor heated shall be constantly greater than that from which the evaporation takes place. Thus for instance, we may consider it as a rule, that the proportion between the two should be as four to one.”

From the practical observations of Mr. Curaudau we may infer, as indeed he hints in his first general conclusion, that the shallow still is preferable, where the object is to prevent the peculiar flavour of the liquor distilled as much as possible from rising, as in distilling from malt, or molasses*; and this not only on account of the saving in time and fuel, but of superiority in point of flavour. On the contrary, in respect to the simple or spirituous distilled waters, as they have commonly been called, where a full impregnation with the peculiar flavour of the vegetable substance employed is desirable, a deep still would appear to be preferable. The proper proportions for stills for some of the finer productions of this kind, however, may deserve a particular inquiry.

(Note by Nicholson—*Journal* No. 108.)

ON SESAMUM, OR BENE PLANT.

THERE are three species of sesamum, *s: orientale*, *s: indicum*, and *s: luteum*. It is only of the first species that I shall speak. It is an annual plant, rising with an herbaceous erect stalk about three feet high, sending out a few short side branches, leaves veined opposite and a little hairy; flowers in loose terminating spikes, small, of a dirty white colour; seeds ovate acuminate, compressed a little, smooth, whitish.

It is highly probable that the Sesamum plant was introduced into S. Carolina and Georgia, by the African negroes imported at an early period after the settlement of that part of the country; and there can be no doubt of the plant having been continued by them, for the purpose of adding to the various articles of vegetable aliment, as corn, sweet potatoes, and rice, of which their

* Or in attempting to procure an insipid liquor from rye. EDIT.

diet chiefly consists. They also parch the seeds, and after bruising them in a mortar, make them into soup, which they season with salt and pepper. The seeds parched and ground with an equal quantity of cocoa, make an excellent chocolate.

The first public notice taken of the superior oil which the seeds yield, was by the late Mr. Morell of Savannah; who, in a communication to the American Philosophical Society, in the year 1769, and published in the first vol. of their Transactions, in 1771, observes, that "the seeds make oil equal in quality to Florence, and some say preferable. Some say, one hundred weight of seed will produce ninety pounds of oil, others say less."* Roman† says, capt. P. M'Kay, of Sunbury, in Georgia, told him that a quantity of the seed sent to Philadelphia, yielded him twelve quarts per bushel." This account has been confirmed by others.

In 1805, I received some seeds from Georgia, and placed them in the hands of B. M'Mahan, nursery and seedsman, for gratuitous distribution, and in a paper in Dr. Coxe's Medical Museum, vol. 2. I noticed Mr. Morell's account of the oil, and also the utility of the leaves in dysentery.

Within two or three years, Mr. Few, of N. York, but formerly of Georgia, commenced the business of expressing the oil for sale:—I have used part of one bottle, two years old, for sallad, during the last year, and can say with safety, that to my taste, it is equal to the finest olive oil I ever tasted. Several bottles of it were also used at the table of the late President Jefferson, during the last year of his administration, and much approved of. The oil is clear and light coloured, and somewhat thinner than olive oil. It has moreover this great advantage over the olive oil, that it does not become rancid by exposure to the air. The remains of the bottle used in my family last year, are now as sweet as when it was opened. This quality was long since remarked by Romans, who adds, that the second expression, which is procured by the addition of hot water, is muddy at first, but on standing, it will deposit a white sediment, and become limpid as the first running. The

* A keg of the seeds was sent to the Society by Mr. Morell, but no attempt was made to cultivate the plant.

† Account of Florida, New-York, 1775.

oil is at first of a slightly pungent taste, but soon loses that. Last year I received a half rice tierce of the seed, which I sent to Mr. Garnet of New-Brunswick, to press, and hope soon to receive the oil from him.* Should it prove equal to that which I now have, I will use no other as an article of diet.

When we reflect upon the immense quantities of every species and quality of oil which are consumed in medicine, diet and the arts, we cannot entertain a doubt of the ready and extensive sale, and profit that would attend the cultivation of the *Bene plant*.

Hitherto, the great profit attending the cultivation of cotton, would not permit those who had land fit for it, to listen to the suggestion of the probable advantage to be derived from any other crops; but the circumstances of the world are now changed. The great tracts of our country at present devoted and devoting to the cultivation of cotton, added to the political situation of the old world, has lessened the demand for the article, and consequently diminished the price of it. The late embargo too, which the unjust conduct of the warring powers of Europe forced the American government to adopt, and which deprived them of our cotton, have induced France to grow it largely in her southern regions, and to stimulate the Italians to a more extended cultivation of it than hitherto. In the last *expose* of the situation of the country by the minister of the interior; it is said, hopes are entertained that France and Italy will be able shortly to supply all the cotton that the two countries may require. England also, besides her West-Indies will receive it from Africa, where great exertions are making to raise it, and whence too, it is known one or two vessels arrived last year in England with the first cargoes of the article; it is probable that the cotton of Africa, will be for some time inferior in quality to the cotton of the United States, but practice will make perfect, and we shall not for a long time find any sale for our cotton on the continent, owing to the powerful influence of the French emperor: all these causes combined, must necessarily diminish the price of cotton, and ought to show the planters of

* Mr. Garnet has erected a wind-mill upon a new construction to grind grain, crush flaxseed, &c.

the southern states the necessity of turning their attention to the raising of new articles of commerce.

Mode of Cultivation.—Mr. Morell directs to sow the seed in holes about three feet apart, dropping in each about ten grains, and when up, the plants are to be thinned to three or four of the most promising. The seeds will appear (in Georgia) in September, and when full grown are to be gathered in before they become dry. The method is as follows:—as soon as you perceive about three-fourths, or four-fifths of the pods ripe on the stalk, and the lower pods begin to lose their seeds, it is time to take it in, for after that, as much as ripens one day at top, so much falls out of the pod at bottom: then take a sharp hatchet bill, or some such weapon, and with it cut off the stalk, twelve to eighteen inches below any of the seed, holding the stalk with the left hand; and when cut, a second person is to receive it, keeping it upright, till he has his load; if turned down, the ripe seed will fall out of the pods. It is then to be carried to a barn and set upright on a close floor, or left in the field, till all the pods are fully ripe and open; then threshed and sifted.

The *dibbling* plan recommended by Mr. Morell, would be very tedious, even in the southern states, if pursued extensively; for cheap as the labour of slaves is, compared with our northern cultivation, there are few estates, where the time which a more expeditious mode of cultivation would save, might not be profitably employed. It is probable, that the seed sown broad cast upon land properly cleansed, and harrowed in, would answer well. Whether it would be necessary to mix sand or ashes with the seed, to insure a regular crop, and the quantity of seed per acre, are matters which the experience of a year or two would teach. If however the drill system is preferred, the seed may be dropped from a common turnip drill, and sown eighteen inches apart, and the intervals kept clean by the horse hoe, or hand hoes. Sickles, or reaping hooks might be used to cut it down; the early morning after a heavy dew, or a misty day, should be chosen, to prevent the dropping of the seeds.

The stalks may be tied up in small sheaves, and set up against the fence or the side of the field, where the immature seeds would

speedily ripen. The direction of Mr. Morell, to begin to cut before all the seeds are ripe, should be strictly attended to, otherwise great loss will be sustained in cutting and removing the sheaves. In leading them to the barn from the field, care must be taken to have the carts tight, in order to save the seed which may shell out; and if a coarse cloth be spread on the bottom, the quantity of seed saved would be much increased.

One of the objections which may arise to the cultivation of *Bene* for oil, is the want of a mill to crush the seeds. I shall endeavour to supply this want, in a future number of this work.

I have recommended the *Bene plant* to the enlarged notice of southern planters, solely on account of the oil it yields; but it is also worthy of attention by reason of the medicinal qualities of its leaves. This fact alone ought to entitle it to cultivation on every farm in the southern and middle states. The dysentery, a disease that frequently ravages our country settlements, yields very readily to an infusion of the leaf in water. In the year 1803, during an epidemic flux, which raged with great violence in the upper country of South Carolina, this remedy was attended with the best effects. Three or four leaves infused in a pint of cold water, will in a short time yield a thick mucilage, which may be given to the quantity of five or six pints daily. The infusion of the dried leaves is equally beneficial.

ACCOUNT OF THE SOCIETY FOR IMPROVING THE BREED OF CATTLE IN PENNSYLVANIA.

THE increasing spirit for improvement, of every kind, in Pennsylvania, and especially in Agriculture, and a conviction of the great influence which a well regulated Society would have in promoting the object of a general improvement of the breed of domestic animals, induced several gentlemen in Philadelphia and its vicinity, to associate last year, under the title of the "Pennsylvania Society for improving the breed of Cattle;" who have published the following address.

A NUMBER of persons concerned in grazing, and residing in and near Philadelphia, having formed themselves into a Society for the purpose of endeavouring to improve the breed of Cattle in the United States, but particularly in the State of Pennsylvania, beg leave to call the attention of those who are interested therein, to the important subject.

Although the neat Cattle of the northern states in general, are the best formed in this country, and after having had the advantage of good pasture, make as fine beef as any part of the world can boast of; yet it cannot be denied that there is much room for improvement. This is not to be wondered at, when it is considered, that in England, where the attention of numerous persons has been successively directed to the improvement of every species of domestic animals, for upwards of the last fifty years, it is acknowledged by the best authorities, that even at the present day, good cattle are extremely scarce, and of course command very high prices.

The present time is peculiarly favourable for the commencement of a change in our stock, and many circumstances combine to render the undertaking highly propitious.—The attention of more persons of capital, than formerly, is directed to the cultivation of the earth: the taste for education, and the means of obtaining it, are rapidly diffusing throughout the country: the spirit for settling our new lands is yearly increasing; our population is augmenting to a degree unexampled, owing to the enjoyment of peace, the productiveness of labour, and the freedom and

equality of our religious and political institutions, which invite the peaceful and oppressed from all nations to our shores.

We have moreover, another advantage of infinite consequence towards ensuring success to our attempts, viz. the experience of the European improvers. Their plans of procedure are detailed to us, the errors they committed in their first attempts are pointed out, and we know by comparison, the superiority of their present improved stock over their former breeds, and in some respects over our own. We may therefore avoid the errors which they acknowledge were committed, and may pursue without fear of failure, a line of conduct grounded upon principles, which their experience as well as our own, have shown to be correct.

The different dispositions, and qualities of cattle, are well known to all who have had any experience in the business of grazing. Some will come to maturity, or fatten much sooner than others ; in some the finer and more valuable parts are the heavier ; while in others, these are light, and the coarser abound : if then we consider the great difference in the profits to the breeder or grazier, in rearing or feeding one or the other kind of animals, the importance of propagating that breed, which possesses the more valuable qualities, must be apparent to all. Repeated observations have established the point, that such qualities are very generally connected with certain forms, and as the knowledge of those forms was hitherto only to be obtained by a course of experience, sometimes at much cost, or certainly at more cost than was desirable ; the Society are preparing a publication, which among other papers will contain the information requisite, and also directions and remarks, tending materially to assist the endeavours of those who are disposed to commence the improvement of farm stock.

For the purpose of knowing what cattle of improved breeds are among us, and to give an opportunity for the more easy diffusion of valuable stock, the Society have resolved to establish CATTLE SHOWS in the vicinity of Philadelphia. Notice of the time and place for holding these, will be publicly given, so as to enable the possessors to exhibit their stock.

Premiums are also intended to be offered for the best domestic stock of all kinds, and for improvements therein; the particulars of the premiums with the conditions, will be shortly announced.

Communications on the subject of improved stock, are solicited by the Society.

LAURENCE SECKEL, *President.*

Philadelphia, April 16, 1809.

As one of the most powerful means for the improvement of Cattle in the United States, public shows, naturally occurred first; and next, the offer of premiums for the best formed and most valuable animals; for beef or milk. By the first measure we shall be enabled to know the exact state and kinds of animals among us; we shall hear the observations and remarks of those who offer to public view what they think fine animals, and the less informed may thus learn; erroneous opinions of the young breeder may be corrected as to the forms of animals, or just ones be confirmed, by the exhibition of cattle of good proportions, which will be brought to the exhibition.

By the offer of premiums, for the domestic origination of superior breeds, the farmer who kills indiscriminately all his finest and most thrifty lambs, calves or pigs, because they bring a little ready money, will be induced, from the expectation of a higher reward, and of public praise, to reserve his best stock, and thus gradually improve the breed of the country.—We may not unreasonably expect too, that some of the foreign improved breeds of Europe will be added to our present stock. The OBJECT is of IMMENSE IMPORTANCE, and highly worthy the attention of those who have the means of rendering such essential service to their country.

But this is not the only good consequence that will flow from our Society. The spirited young cultivator when once informed upon the nature of various breeds, and made acquainted with the principles upon which he ought to proceed in forming his stock, will be induced to originate good forms by one or more careful and judicious crosses, and he will be induced to keep this

stock pure, because of the high prices which they will bring, when the public become fully aware of the superiour profit resulting from keeping such stock, over the common breeds of the country.

CATTLE SHOW.

THE first show of Cattle took place at Bush-hill on the 18th and 19th of July, and notwithstanding the rainy weather, and the confusion arising from the influence of an anonymous notice in the newspapers, that the show would be held on the 10th of the month, the company was numerous and the stock gave great satisfaction, and induces a belief, that the future exhibitions will be still more extensive and valuable.

The following cattle were shown on the first day.

1. A steer five years old, raised and shown by John Pearson, Esq. of Darby—large capacious carcase, wide hind quarters—a good figure.

2. A steer—good figure, broad deep body, straight back—weight 2030 lbs.

3. A spay'd black Heifer, from Berks county—weight 1512 lbs. small boned, fine limbed, small neck and head, straight back, broad rump, wide twist, in short an animal of uncommon symmetry and elegance of form. Scott's portraits of English prize cattle, show none equal to this animal.

The possession of a stock which would insure such animals as any of the above, might be considered a great acquisition in any country. We do not know the treasures we possess in the animal tribe; but it is to be hoped that the cattle shows will bring them forward, and also give rise to the introduction or origination of more.

4. A free martin* and an ox, twins—weight at turnpike scales, 23 cwt. 3 qrs. round compact figures, and very well made. They had been worked together.

5. A cow and a calf—the latter six months old—weight 644 lbs.—By Mr. Dubs.

* When a cow has twins, and one is a female, she never shows any disposition for the bull. Such are called free martins.

6. A cow four years old, which gives ten quarts at a milking, and her calf one year old, large size.—By Mr. James Coyle, Turner's lane.

7. Several rams and ewes of the Merino breed of sheep, 1-2, 3-4, and 7-8 blood.—By Col. Humphreys, from near New-Haven, Connecticut.

8. Two rams and two ewes of the Irish breed of sheep—one of the rams was six years old, and of great size; he was the sire of the largest wether, (live weight 276 lbs.) fattened by J. Hickman, and killed last spring in this city. The large ram was sold to Mr. Sloan, of New-Jersey, for 45 dollars. A ewe for 25 dollars. A lamb of this breed at four months old, weighed 94 lbs.—By Mr. Weston, near West Chester.

9. Two 7-8 blood Merino rams, and two 3-4 do.—One of the 7-8 had his last year's fleece on. He was left unshorn this season, in order to show that the Merino breed do not lose their wool like all other sheep, when the new coat is forming.

10. A broad tailed ram of the Barbary breed.*

11. A ewe of the new Leicester or Bakewell breed of sheep, so deservedly famous in England for speedy fattening. This excellent breed, notwithstanding the selfish policy of England,† exists in great purity near New-Brunswick, New-Jersey, on the farms of M. Smith, Esq. and Capt. Farmer. Tups are let readily at 200 and 150 dollars the season. The ewe shown is small boned, head small, neck neatly set on, body round and compact, loins broad, and the general appearance very handsome. She is one of 16 ewes from the stock of Miles Smith, Esq.—By Dr. Mease.

* For an account of this breed of sheep, see *Memoirs of the Agricultural Society of Philadelphia*, vol. 1.

† By a law passed in the 28th year of the present king's reign, any person sending a sheep, wether excepted, out of the kingdom, forfeits £.3 for every sheep, and if detected suffers solitary confinement for three months. The vessel is also forfeited.

On the second day, the following cattle were shown.

1. A Suffolk polled cow, by Turner Camac, Esq. She gives 17 quarts of milk—of good form, small neck and head, and fine limbed.

2. Twin cows—21 months old, well formed, fine limbed. One had a calf three weeks old. The other was shortly to calve.—By Mr. J. Thornton, of Lower Dublin, Philadelphia county.

3. A bull 6 years old, bred by Joseph Sims, Esq. from a bull imported by Mr. Ketland, and an Alderney cow imported by Mr. Sims—large, full quarters, round body, very gentle. His calves are in great estimation.—By J. Clift, of Lower Dublin.

A very fine fleece, full blood Merino, was exhibited by James Caldwell, Esq. and samples liberally distributed. This gentleman in consequence of the late notice in the newspapers, that the show would be held on the 10th inst. brought a very fine tup lamb 6 months old to town, from his farm near Haddonfield, New-Jersey; which owing to the fatigue and the heat of the weather, died in this city the next day. He weighed 87 1-4 lbs. his fleece weighed 5 1-4 lbs. exclusive of some ounces not taken off from the under part of the body. The same spirited improver stated that he has this spring sheared 12 1-2 lbs. washed wool, from two yearling full blood Merinos, of his own raising.

Dr. Mease read an extract of a letter just received from Mr. Robert R. Livingston, of New-York, stating, that from a full blood Merino yearling ram, bred by himself, from stock which he sent from France, while he was our minister there, he cut 9 lbs. 6 oz. of wool, and that from a full blood ram, also procured at the *National Farm of France*,* he obtained 9 lbs.—the wool sold for two

* The French government for many years have had a farm exclusively devoted to the raising Merino sheep, under the care of an able man, for the purpose of affording the farmers an opportunity of supplying themselves with the breed; and it is a fact, that by superior attention, the form of the animal is not only improved, but the quantity of the wool obtained from them is treble that of the breed in their native country. The quality is also improved—and yet the sheep nevert ravel like the Spanish flocks: a full proof, among numerous others, that the change of climate is not necessary to the preservation of the quality of the fleece, as commonly supposed.

dollars per pound.—Samples of both were shown and greatly admired, being of silky fineness, and the staple unusually long.

The fact of the greater weight of the Gallo American fleece, shews sufficiently, if any proof were *now* required, that neither our climate nor our soil are unfavourable to the quantity or quality of wool.

The second show took place on the 24th, 25th, and 26th October, 1809.

The President of the Society produced a very fine black and white steer, which he purchased in March last, and had fed in his luxuriant meadows at Schuylkill point. The steer was raised in Lancaster county by Mr. Moyer, and gave great satisfaction, being of superior size, and of an excellent form.

Mr. D. Seckel and Mr. John Barney, sent two large cows; that belonging to the former intended for feeding*—the latter of better form was sold for 45 dollars, as a breeder, to Mr. Guier.

Mr. Serrill, of Darby, produced a cow from Mr. Ketland's bull, and her calf, both of which commanded attention. The cow was of good form, and the calf of great size for its age.

Mr. Rodman, of Buck's county, exhibited a heifer 4 years old, of great size, and good proportions, raised by himself.

Mr. Benjamin Wilson, of Lower Dublin, produced a cow of the Suffolk polled breed of a superior form, and an excellent milker.

Mr. Castor, of Frankford, sent a young bull, from the Dutch breed of Mr. Waln. He was sold for 40 dollars, to Mr. Guier.

Mr. Thomas Garrett, of Upper Darby, sent a ram lamb of the preceding season, the produce of a full blooded ram of col. Humphreys' stock, then in the possession of Dr. Mease, and a fine ewe of good size, of the Irish breed. The lamb was very fat, exhibited strong marks of blood, and was larger than his sire.

Dr. Mease exhibited several Merino sheep of various degrees of blood, being crosses between the descendants of rams imported by himself, and the above ram of col. Humphreys' stock.

Mr. Dubs again sent his handsome twins, which so justly excited admiration at the first show. According to the certificate

* This cow was killed 31st March last. She weighed alive 2082 lbs.—Beef 1325—fat 160—hide 106.

of the gate keeper, at the turnpike scales, it appeared that they weighed 27 cwt.*

The third show was held on the 3d of April last, at the same place.

Mr. Joseph Hart exhibited a noble red steer, 6 years old, fed for some months past by himself, but bred by Mr. Blanchard, of Morris county, N. J. Mr. L. Seckel again brought forward his noble black and white steer. Both those animals would have done honour to any country. Their beauty, gentleness, great fatness and majestic appearance, struck every beholder; but the connoisseur in cattle dwelt with pleasure upon their possessing those great and grand points, without which no animal, however large, however fat, can give satisfaction to a judge, or to the economical feeder.

Mr. Seckel also showed two very handsome, light boned, capacious, well proportioned steers, 7 years old, and in high order, weighing about 1200 cwt. one brown and white, the other strawberry and white.

Mr. John Johnson, of Germantown, exhibited a red steer about 6 years old, bred by himself, and in high order, and well proportioned.

* On the 3d April, they weighed 29 cwt. 2 qrs. 14 lbs.

The following are the dimensions of the above cattle, accurately taken.

	Girth behind shoulders.	Round neck.	Round loins.	Below knee.	Height over fore feet.	Height over hips.	Width across hips.	Length of carcase.
	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.
Mr. Hart's steer,*	9	4	8 4	10	5 7	5 7	2 5	8 8
Mr. L. Seckel's steer,†	8 8½	3 11	9	9½	5 4	5 6	2 5	9
Mr. Johnson's ox,	7 6½	3 4	7 11½	8½	4 7	4 10½	2 ½	8 1
Mr. Seckel's brownwhite ox,	8	3 7	8 3	10	4 11	5	2 2½	8 4
Mr. Seckel's strawberry and white ox,	8 2	3 9½	8 4½	9	4 9	4 10½	2 3	8

* Mr. Hart's steer is still feeding, and will be probably again exhibited next October.

† Mr. Seckel's steer was killed on the 5th of April—his beef weighed 1667 1-4 lbs. neat—fat, 224 lbs—hide, 125 lbs.

Mr. Guier showed two uncommonly handsome red oxen in high order, notwithstanding their having been worked during the last autumn and winter. They weighed alive 2520 lbs. Also, a bull, cow and calf, of the Dutch breed, from the stock of Mr. Robert Waln.

Messrs John Ely and A. Eastburn, brought a bull from Solisbury township, Bucks county, of the Bakewell stock, and imported when a calf in 1804 into New-York. His form was deservedly admired: he now stands for public use at the farm of Moses Eastburn in the above township, and cannot fail to effect a great change in the form of the cattle in the vicinity. The zeal exhibited by the owners of this fine animal, in bringing him so great a distance (34 miles) called forth the thanks of the members of the Society. The farmers ought to be grateful for the spirit exhibited in the purchase of the bull at a high price, and for his introduction into this state—and also for the liberality in fixing the sum for his use so low as two dollars. His colour is a good red, and has a small list of white on his back. This latter mark distinguishes Bakewell's stock.*

Mr. Ketland sent a cow, the descendant of a very superiour one of the Teeswater breed,† imported by himself some years since.

Mr. Morton, of Southwark, produced two plates of hats—one made with 6 oz., 1-2 blood Merino wool—the other with 3 oz. Merino, 1 oz. rackoon, and 2 oz. rabbit. He stated that both worked up very well; thus affording another proof of the value of the Merino breed of sheep.

Col. Humphreys favoured the show with a last look of eight or ten 1-2, 3-4, and 7-8 blood Merino rams. Those precious animals, which had been on sale for some months in the neighbour-

* By an authentic certificate it appears, that the bull was imported by Mr. Musson and Daniel Adcock, in the ship Diana, capt. Glover, from Liverpool, in July 1804, when a calf: He is a grandson of Shakspeare which was bred by Mr. Fowler, and sold for 400 guineas at the sale of Mr. Paget's stock, in Nov. 1793.—See Complete Grazier, p. 12.

† This cow was sent back within two years after her arrival here, no one being disposed to pay her cost. Such an event it is expected would not occur at the present day.

hood of the city, bore very strong marks of the blood; and it is to be regretted that they will be for ever lost to Pennsylvania, at least certainly to this part of the state, as they are on their way to the westward, where their value will no doubt be appreciated. Their prices are considerably enhanced since last year.

On the 4th., though not originally intended by the Society as a day of show, the following were sent, viz.—18 very fat and finely formed oxen, by Mr. Dubs. Mr. Paul Jones, of Lower Merion, exhibited a large and well shaped ram of the *new Leicester breed*, with some fine lambs by him. The excellent qualities of this valuable breed, and their origin with Bakewell are well known, and their progress through New-Jersey and Pennsylvania, which is becoming rapid, will add to the wealth of the individuals and of the country. Twelve or fourteen pairs of working oxen, and several horses were brought for sale. Agreeably to the plan of the Society, as announced in their last address, viz. to hold a sale for all kinds of farm stock, Mr. Freeman, one of the city auctioneers attended, but only one public sale took place. It is expected however, and hoped, that drovers, graziers and farmers, will avail themselves of the reciprocal advantages which the institution offers of both buying and selling, and that the next show, to be held on the 1st Tuesday of October, will be generally attended.

PREMIUMS PROPOSED BY THE PENNSYLVANIA SOCIETY FOR
THE IMPROVEMENT OF THE BREED OF CATTLE.

1. To the person or persons who shall introduce into the state of Pennsylvania, and keep for public use, a bull, (colour red, brown, or brindle) of the North Devon, Sussex, Teeswater, Alderney, or of any other foreign milk breed, which shall prove more valuable than the common breed of this country—*One hundred dollars.*

2. To the person who shall import and keep for public use, a bull either of the Hereford, North Devon, or of *any other breed*, whose stock shall be found to feed to the most advantage—*One Hundred Dollars.*

3. To the person who shall originate from our native stock, or from any other in the country, a breed of cattle, the cows of which

shall prove more valuable for milk, than the common cows of the country—*One Hundred Dollars.*

4. To the person who by selection and admixture, shall originate a breed of neat cattle, from our native stock, or other stock, which will come to maturity more speedily than our common cattle; yield the greatest weight of flesh off a given quantity of land; fatten in the shortest time, have least offal, and shall also abound most in the more valuable parts—*One Hundred Dollars.*

5. To the person who shall introduce and keep for hire in the counties of Philadelphia or Delaware, a full bred ram of the New-Leicester breed, (so highly valuable for a disposition to fatten speedily)—*Fifty Dollars.*

6. To the person who shall make the best set of experiments, to determine the comparative merit of the various breeds of hogs in this country, and who shall most clearly state and shew their general qualities or properties, particularly their easiness of keep and of fattening—*Fifty Dollars.*

7. To the person who shall by selection and admixture, originate a breed of sheep from our native stock, which shall fatten most speedily, and produce the most and finest wool—*One Hundred Dollars.*

8. To the person who shall originate a breed of cattle, which as workers prove superiour to all others, for speed of gait, easiness of keep, and fattening—*One Hundred Dollars.*

9. To the person who shall raise and feed ox, steer, or cow, whose weight of neat beef, shall be at least 1500 lbs. and have 300 lbs. of rough tallow—*One Hundred Dollars.*

10. To the person who shall feed ox, steer, or cow, of the above weight of beef and tallow—*Fifty Dollars.*

11. To the person who shall feed ox, steer, or cow, weight of beef immaterial, but whose rough tallow shall amount to 300 lbs. *Fifty Dollars.*

A condition of the three last premiums is, that the animals be killed in Philadelphia.

The Society have not thought it necessary, to offer any premium on the subject of Merino sheep, as the public ought to be fully aware of the very great and growing importance of this inva-

luable breed ; and it is apprehended that this conviction will be a sufficient inducement to our farmers, to lose no time in availing themselves of the means which are happily in their power to propagate it. Those who are insensible to the profit arising from the breed, are not to be induced to adopt it, by the offer of premiums. It ought to be deemed a full performance of duty by the Society, if objects of primary attention—those connected with the immediate wants of the country, are pointed out to the spirited and improving cultivator.

The Society will require the most rigid adherence to the terms of the premiums by the claimants ; and that in order to ascertain the merits of stock for fattening, the actual quantity and quality of food, and the expense and time of fattening, as well as the precise increase of weight of good flesh they have acquired, shall be accurately ascertained and fully proved.

LAWRENCE SECKEL, *President.*

Philadelphia, June 9th, 1809.

The ninth premium has been gained by Samuel Tomkins, of Gloucester county, New-Jersey, who sold an ox of his own raising, in April last, to Miller and Tallman, which weighed 1500 lbs. neat, and had 326 lbs. rough fat ! A committee of the Cattle Society attended the slaughtering and weighing of the animal. At the request of Mr. Tallman, the amount of the premium has been laid out in a piece of plate, which has been accordingly presented, with an appropriate inscription.

It has been very generally known among the graziers of Pennsylvania, New-Jersey, and Delaware, that the President of the Society has held out for several years past, a premium of 100 dollars to any one who would exceed the weight of a bullock fed by him, and which produced 278½ lbs. rough fat, and 1495½ lbs. of beef. Upon the establishment of this Society, it was deemed proper to take this premium upon themselves ; stipulating, however, that the claimant must have raised the animal, and to offer two others,* for the purpose of giving those who chose to try the experiment, an opportunity of showing the extent of good feeding, and to con-

* Nos. 10. and 11.

vince the old world of the great capabilities of the stock of the United States. But once gained, they will not be repeated: the Society being well convinced that such over ripe cattle do not pay for the extra quantity of food they consume, and attendance given, and that of course, however the self pride of the feeder may be gratified in the production of them, the object of the Society, which is radically to improve the stock of the country, is not promoted thereby, this being to introduce from abroad, or to originate at home, *such breeds as will fatten to the greatest sizes, and on the best parts in the shortest time; or, in other words, that will pay most and quickest.*

SPEEDY PROCESS FOR ROTTING HEMP.

From Bibliotheque Physico-æconomique—By M. Braalle of Amiens.

M. BRAALLE, formerly an abbe, had long paid attention to the subject of hemp; and published a pamphlet on its cultivation and preparation, which was reprinted by order of the "Lords Commissioners for trade and foreign plantations," of England, in 1790. Successive and repeated experiments enabled him to discover a method of more speedily rotting the hemp, the account of which having reached the French Government, he was desired to come to Paris in 1801, to make a fair and public experiment of the process. He accordingly performed it before M. Molard, administrator of the conservatory of arts and manufactures, Messrs. Monge and Berthollet well known and excellent chemists, and Mr. Tessier celebrated for his æconomical knowledge;* upon their favourable report the minister of the Interior published the process of M. Braalle for general benefit. It is as follows: Provide a copper or brass vessel (iron will probably stain the tow) allowing rather better than one gallon and a half (wine measure)

* Editor of the "Annals de l'Agriculture Francoise."

in contents, per lb. of hemp: thus to work on 50 pounds of hemp the vessel should hold about eighty gallons. It should be in shape cylindrical, but if it can be set up on end (vertically) it answers still better. This quantity of hemp will require one pound or one pound and a quarter at the utmost of (*savon verd*, green soap,) soft soap, well made, and without lime, and not containing a superabundance of lye, (as our common family made soft soap often does,) but boiled till it has taken up a sufficient quantity of fat; that kind of soft soap, in fact, that will not chop the hands. Put this soap to as much water as, with the hemp to be put in afterwards, will nearly fill the vessel. Bring the water and the soap to a boiling heat, or near it; when it is a little under a boiling heat (200 deg. Fahrenheit's thermometer) put in the hemp, cover the vessel close, and draw out the fire, and let the hemp stay two hours. Take it out at the end of that time; cover it with straw that it may cool gradually. Spread it on the floor next day; and push the band to the top of the bundle; then run a heavy roller over it several times, which answers the purpose of beating. It peels easily, whether wet or dry. When peeled, tie it in bundles, and spread them on the grass for five or six days to bleach. Turn them, and after five or six days, they may be removed to the warehouse. If the hemp is intended to be stripped, not wet, but dry, spread the hemp stalk itself on the grass for that length of time to bleach it.

The quantity of soap necessary for a complete rotting, is to that of hemp as 1 to 48; and the weight of hemp to that of water, as 48 to 650.

The same water may be employed for fifteen days continually: care being taken to add soap after each steeping, to replace what has been absorbed, and to heat the water to the former temperature.

REMARKS.

A very good apparatus for the process, is formed by a boiler and wooden tubs, with covers for steeping-vessels.

In the old method for treating hemp, it is laid down on the grass and exposed to dews and rains for a month or six weeks,

being turned two or three times a week. This facilitates the separation of the tow from the stalk ; but this process takes away so much from the string of the tow, that government will not buy hemp thus manufactured.

Another method is, to steep bundles of hemp in creeks, ponds or ditches, from ten to twenty days according to the state of the weather ; the tow is thus rendered separable from the hemp stalk. In creeks, this method is liable to loss, and in ponds or ditches the mud and dirt hurts the colour and quality of the tow.

The advantages of M. Braalle's method are. 1st. The great expedition of the process. 2d. Its being practicable at all seasons. 3d. It is not injurious to health, and does not produce any bad smell. 4th. A saving of expense, when a proper apparatus is used in the operation. 5th. Superiority in the hemp so prepared, and less waste produced, so that nearly a fourth more hemp is obtained from the same quantity of raw materials. By the crooked and old process, 800 lbs. of hemp-stalks produced when steeped, pulled and beaten, 150 lbs. of pure tow ; by M. Braalle's process the yield is 200 lbs.

Mr. Cooper of Northumberland, Pennsylvania, has proposed to improve the process of M. Braalle, thus : " I suppose an establishment of one boiler holding eighty gallons, and three cylindrical wooden tubs or barrels near it. Fill the barrels with 50 lbs. weight of hemp each. Fill the boiler with water, and one pound and a quarter of soft soap ; when it boils let it run off by a cock into one of the barrels of hemp placed below. Cover it up, and while this is steeping fill the boiler for the second barrel. In less than an hour you can make the second eighty gallons boil ; turn it into the second barrel of hemp. Then boil a third portion of soap and water, and by the time it boils, you will be ready to empty the barrel of hemp first filled, and thus in a summer's day, one person can manage with ease 750 weight of hemp, if another be employed in taking it out and spreading it."

The green soap directed to be used by M. Braalle, differs from common soap, in being prepared with oil of hemp seed, instead of the common animal fats. It is of little consistence, and upon a slight addition of water assumes the form of a paste. From

the care taken to specify the green soap as the most proper to be employed in the process, we must suppose experience had taught him, that it possesses superior powers to the soaps made with other oils, and yet in the classification of various oils according to their aptitudes for making good soap, by the French chemists, * *hemp seed* oil is placed sixth on the list: from the known practice however by the manufacturers of colouring other soaps green, the probability is that the superiority of the green soap is generally acknowledged. Whether green soap is commonly used in Flanders, is uncertain; but a soap bearing the name of that country, was found by M. Roard, director of the dyeing establishment in the French National manufactories, to be superior to any other for scouring wool, "giving it a degree of whiteness which is extremely difficult to produce by any other means." See *Annals de Chimie*, No. 158.

I have taken measures to be informed of the particular reasons of Mr. Braalle for directing the green soap, and when enabled, will

* A great scarcity of this article was experienced in France, in 1793, when the civil commotions forced a great number of the manufacturers to relinquish their business: at this period other manufactories were established in different parts of the country, but the article was very inferior. The necessity therefore was felt of making more generally known the principles upon which the manufacturing of good soap depend. Three well known chemists being invited by the government to concur in the design, instituted a course of experiments for the purpose of ascertaining the best method of preparing soap, and the substances that deserved the preference in this manufacture. The chemists were Darcet, Pelletier, and Lelièvre. The experiments of those gentlemen enabled them to class the oils nearly in the following order, according to their different degrees of aptitude for forming good soap.—1. Oil of olives, oil of sweet almonds.—2. Animal oils, fat, butter.—3d. Oil of colza or rape.—4. Oil of turnips, oil of beechmast.—5. Fish oil.—6. Oil of hempseed.—7. Nut oil.—8. Linseed oil.

The oils of hempseed, colza, turnip, and linseed make a soft soap. They say, oil of hempseed yields a green colour—oil of colza or rape, a yellow soap. Linseed oil, which is colourless, may be coloured by the addition of a yellow or blue pigment—namely, curcuma for the yellow, and indigo for the blue: but as these different oils are usually employed mixed together, the manufacturers add during the boiling a mixture of curcuma and indigo when they wish to have green soap. By exposure to the air, it becomes white, and afterwards brown.

communicate the result of my enquiry. In the mean time the *common soft soap* of our country, not sharp, may answer.

The process of Mr. Braalle was published by the minister of the interior in 1803, after a public experiment had been made by order of the French government, before M. Molard, the administrator of the Conservatory of Arts and Manufactures: and the duke de Liancourt, in order to teach the process to the people of the district in which he lives, and who raise much hemp, made another trial of it, the next year, before many of the inhabitants who assisted thereat, and in presence of Messrs. Molard and Braalle who were invited to attend on the occasion. The common kitchen utensils were employed, and with the most complete success. The hemp after being rotted, was delivered in small quantities to all the women who assisted at the experiment, and they unanimously acknowledged, that it underwent with ease the ordinary operations, and that it had all the requisite qualities in a degree superior to hemp rotted according to the usual process.*

The above facts leave no doubt as to the utility of the process of Mr. Braalle; the adoption of it is therefore recommended to the American farmer,—the account of whose experiments will meet with a welcome reception by the Editor.

OBSERVATIONS ON SHEEP.

CHAPTER I.

IMPORTANCE of Sheep.—Division of the species as to fleece.—Encouragement to American Shepherds, from our climates and the health of our flocks.—Examples of successful attention to their improvement.

It is impossible for one practically acquainted with the oeconomy of this interesting part of the brute creation, and who is moreover impressed with a sense of the various and important uses to which every part of their body is applicable; to forbear paying them a tribute for the rank they hold in the scale of general utili-

* Memoirs de la Soc. d'Agric : de Paris.

ty. Without detracting from the acknowledged importance of the horse or of the cow, it cannot be denied, that sheep form an indispensable link in the chain of agricultural objects, and excite a peculiar interest in those, who are alive to the influence of the tenderness, the innocent gambols of the progeny, and to the expressions of affectionate solicitude of the female parent. While their flesh increases the supply of substantial and delicate food, their wool adds to the means of obtaining it, by furnishing ample employment to the industrious poor, by whose labour it is made to protect the irritable skin of the infant, to defend the hardy mariner or soldier from the winter's storm, and to "cherish and adorn the person of the prince."* Even the offals of his body are made to contribute to our necessities. We are indebted to his skin for the means of recording and preserving a permanent evidence to the titles of our property, and for other purposes; and even his bones are applied to various uses in the arts.

Connected with the culture and improvement of the soil, and consequent profit of the farmer, the value of sheep is great. They not only subsist, but fatten upon soils, too poor for the support of larger animals; and while they enrich the surface by a great quantity of manure, they save the trouble and expense of subsequent labour, by its equal distribution. They eagerly devour many plants and weeds rejected by other stock, and in particular rid our stubbles of the troublesome *ambrosia*†, alike exhausting to the land, and injurious to the dairy. But to the gentleman farmer, they are invaluable; they afford him the least hazardous employment, and the most rational amusement resulting from his experiments and trials to perfect his breed; and whether we refer either to the invaluable Merino, or to the common breeds, give the greatest and quickest return for the capital employed, with the least trouble or risque, of any species of stock: but above all, they enable him to diminish the number, and to circumscribe his confidence in servants, whose idleness and waste often detract much from the pleasures of a tillage farm.

The most general divisions of sheep, are into the long and short woolled: the one proper for combing, and worsted stuffs, and

* Lawrence on cattle. † Bitter weed.

coarse cloths, the other for carding and making fine cloths*. In Europe, and particularly England, those varieties are kept distinct with great care, from a conviction, the result of long experience, that a mixture of the long and short woolled breeds, produce a fleece, good for neither purpose. In the United States, with probably but few exceptions, little attention has hitherto been paid to this important point; the consequence is, that no particular breeds, until lately, could be named or distinguished as pure, being mostly mixed, and from the little attention paid to the selection of rams, a degenerate race had been produced, which called loudly for a change. The rapid increase, however, of our cloth manufactures, and the great spirit which is prevalent throughout most parts of the country for improvement in the breeds of our domestic animals, will no doubt point out to our farmers the indispensable necessity for close attention to the subject, and the great emoluments to be derived therefrom. In England, where attention has been paid for years to the improvement of stock of all kinds, and where we might suppose that especially in the case of sheep perfection had long since been attained, it is wonderful to hear of the continued exertions made to improve, and of the care they take to preserve the purity of their several varieties.

The general hardihood of the American sheep, their freedom from disease, and consequent multiplication, are fully sufficient to shew how well adapted the climates of the United States are to this invaluable breed of domestic animals: to prove also what capabilities there are for improvement, and what may be done by care, a few instances shall be given of the weight of sheep in different states, and the quantities of wool yielded by them. The general healthiness of our sheep, is indeed a most important consideration, and additional source of encouragement to a spirited extension and improvement of our stock. Their complaints are

* Even in the same fleece, various kinds of wool are found suitable to the fabrication of articles very dissimilar in their nature, and adapted to purposes in the manufacture of a description totally different from each other. The separation of these constitutes the business of the *wool stapler*, whose art shall be unfolded in a succeeding number of this work.

few and simple, and of course easily cured, whereas those that affect the sheep of Europe are numerous and very fatal; it is not uncommon for whole districts to be swept by epidemics, even the names of which are unknown here; and the solitary complaints that attack individuals, also require unceasing care and attention on the part of the farmer, from which we are happily in great measure relieved.

There is no reason to doubt the congeniality of every part of the United States, except some low marshy districts, to sheep of either the long or short woolled varieties. Even in the dry maritime parts of the states of South Carolina and Georgia, if shelter be provided, to which the animals will, of their own accord, naturally resort, I entertain no doubt of their doing well with care. Several spirited gentlemen of the first mentioned state, have made a beginning with the Merino breed, and from them we shall learn whether it will best answer to extend that race, or adhere to the coarser woolled. The western parts of those states, however, which are blessed with a very mild climate, either as it respects heat or cold, are peculiarly calculated for breeding sheep, because they would require little attention as to food, either winter or summer*, and should these remarks reach those distant regions, it is suggested to their happy citizens to turn their attention to the subject. The fleeces of their native stock are at present of a superior quality†.

Notwithstanding the general neglect and inattention which have prevailed with respect to the sheep in this country, there have

* Destruction from wild beasts may be avoided, by penning sheep at night near the house; a high pen of half an acre, might be made, and removed occasionally—no more certain method could be adopted to manure the land. After they have been driven up a few times at night, the sheep will regularly return home (as I well know) to the fold at the close of the day.

† Mr. Wm. Maclure informed me, that in a tour to the back parts of Georgia, the winter before last, he found at the bottom of the iron mountain, a district of country abounding with wool, the fineness of which excited his admiration. The inhabitants abound in every thing which moderate ambition could wish for. They bought nothing except salt. Their houses were filled with clothing from the fine wool mentioned, mixed with cotton, of which article, they raised immense quantities, and woven by themselves.

been some in several of our states, who have considered them in the light they deserved, and whose success not only shows the congeniality of the climate to their constitutions, but also establishes the important point, that the imported varieties do not degenerate in the United States. More facts of this kind will be given, when treating of the Merino breed.

Among the improvers of domestic sheep, Mr. Custis, of Arlington, near Alexandria, certainly stands conspicuous. By repeated crosses with a foreign stock, he has greatly lengthened the staple of our common wool: he has brought to view, and I hope will bring into action, the native Smith-island sheep, which for fineness and length of staple, promise to be a valuable acquisition to our stock of combing wool; and by his offer of premiums for improvement in native sheep, and his annual public shearings and shows, he has roused and fostered a spirit, which it is to be wished will continue a long time to increase.

At Mr. Custis's shew, on the 30th of April, 1805, the following were exhibited.

Bakewell, the prize ram, of one year old, bred by Col. Thomas Ludwell Lee*, of Loudoun county, Virginia—Weight of the fleece, 12 lbs. 5 oz.—length of the wool, extreme 13 inch. in ordinary 11 inch.—gross weight of the carcase, one hundred and forty pounds. The extreme length of the animal from the nose to the buttock, 4 feet 9 inches; the girt of the body 3 feet $7\frac{1}{2}$ inch.; and the length of the fore leg from the brisket to the ground $12\frac{1}{2}$ inches. The above dimensions, and gross weight of carcase, were taken after shearing.

Four prime ewes were then shorn, bred by Mr. Custis, from the imported ram, upon the improved Mount Vernon breed:

No. 1. Weight of the fleece, 7 1-2 lbs.

— 2. — — — — 7 1-4 —

— 3. — — — — 6 3-4 —

— 4. — — — — 6 1-2 —

A ram lamb of two and a half months old, weighed gross eighty-one and a half lbs.

* Mr Lee was a highly respectable character, an excellent farmer, and passionately devoted to the improvement of his sheep. His death, which took place in 1806 or 1807, may be considered as a public loss. At that time I was informed that his flock was distinguished for their beauty.

At subsequent shows, the following were exhibited.

1. An ewe of one year old, estimated at 7 lbs. per quarter—fleece 7 lbs.—length of wool 9 inches.

2. A ram lamb of one year old, carcase 10 lbs. per quarter—fleece 7½ lbs.—length of wool 9 inches.

3. A ram lamb of one year old, carcase 11 lbs. per quarter—fleece 7½ lbs.—length of wool 8 inches.

4. An ewe lamb of one year old, carcase 8 lbs. per quarter—fleece 5½ lbs.—length of wool 8 inches.

The lambs were all bred from Bakewell, the prize ram of 1805, and crossed upon the last improvements.

Superb, a lamb of one year old—weight one hundred and eighty pounds.

Badger, by Mr. Foote, of the Arlington long woolled breed—fleece 9 lbs. 3 qrs.

A lamb by Mr. Ludwell Lee—weight 16½ lbs.—fleece 7½ lbs.

Mr. Osborn Sprig, of Northampton, near Bladensburg, Maryland, is a distinguished breeder of sheep and stock of all kinds. Two rams, each ten years of age, weighed in the spring, (1809,) 188 and 196 lbs.—one had 10½ lbs. wool, the other 9½ lbs. both unwashed. They were from the Helder. A ram lamb, part Helder and part South Down, weighed 119 lbs. the day he was four months old. One ewe of the same class, gave 12 lbs. of wool. Two rams, pure Helders, and seven ewes of the mixed breed, averaged 9 lbs. of wool: all the above unwashed*.

Weight of fleeces and length of wool of eight ewes of the flock of Col. Tayloe, Mount Airy, Caroline county, Virginia, 1808.

No. 1. wt. of fleece 6' 3-4 lbs. Length of wool 6 inches.

— 2.	-	-	7 3-4	—	-	-	9	—
— 3.	-	-	5 1-4	—	-	-	8	—
— 4.	-	-	8 3-4	—	-	-	10	—
— 5.	-	-	7 1-2	—	-	-	8	—
— 6.	-	-	7	—	-	-	8	—
— 7.	-	-	8 3-4	—	-	-	9	—
— 8.	-	-	8 3-4	—	-	-	10	—

62 1-2 lbs.

* Letter to the Editor.

Gross weight of lamb No. 8, after shearing	93	lbs.
Fleeces of sixteen old sheep weighed	63	—
Do. of eight lambs	60	1-2 —

123 1-2 lbs.

Average 5lbs. and upwards.

A shearing of seven ewes, took place at Rose Mount, the residence of Doctor Kent, in Prince George's county, Maryland, on the 25th of May, 1809, the following was the result.

No. 1. 3 years old, yielded	7	1-4 lbs.
— 2. 3 do. do.	6	1-4 —
— 3. 1 do. do.	8	—
— 4 and 5. twins, 1 year old,	6	1-4 — each.
— 6. same age,	6	1-4 —
— 7. do.	6	1-4 —

Average weight of wool yielded by three years old, $6\frac{3}{4}$ lbs. of the yearlings, $6\frac{1}{2}$ lbs. The wool was clean and of a good quality. The lambs are the cross of the Calvert county and Dorsey sheep, and make good mutton. They are easy feeders, not remarkable for size, but well formed and keep their wool clean.

In a part of the country where the sheep do not commonly yield more than half the average weight, the above may be considered as respectable proof of care and attention in selecting, and of good keep. The same gentleman sheared 11 lbs. from a yearling—a cross with a Barbary broad tailed ram.

May 29, 1809:—R. Smith, of Upper Freehold, Monmouth county, New-Jersey, sheared from eleven yearling ewes, $81\frac{1}{2}$ lbs. washed wool, which is more than 7 lbs. 6 oz. per sheep—weight of three previous to shearing, but after being washed and dried, 109 lbs. 98 lbs. 111 lbs.

Produce of yearling Helder ewes imported by D. Clarkson, of New-York, and a full blood New Leicester ram of Capt. Farmer, of New-Brunswick :

1. Ram, weight on foot, 12th of May, 1809, 175 $\frac{1}{2}$ lbs washed—of fleece on 18th of May, 8 $\frac{1}{2}$ lbs.—of carcase after shearing 163 lbs.—loss 4 $\frac{1}{2}$ lbs.

2. Ewe, weight on foot 12th of May, 128 lbs.—of fleece on 18th May, $10\frac{1}{4}$ lbs.—of carcase after shearing, 116 lbs.—loss $1\frac{1}{2}$ lbs. The above was sold to Major Johnson, Salem, New-Jersey.

3. Sir John, yearling ram, clean washed, and dry, on foot, $175\frac{3}{4}$ lbs.—weight of fleece, 11 lbs.

4. Doctor, clean washed, and dry, on foot, $141\frac{3}{4}$ lbs.—weight of fleece, $8\frac{3}{4}$ lbs.

June 2, 1810.—A yearling ram, belonging to B. B. Cooper, of Gloucester county, New-Jersey, the produce of a cross between a Helder imported ewe of Mr. Clarkson's, and Farmer's New-Leicester ram.

Weight of wool,	-	-	-	8 lbs. 11 oz.
Weight of carcase,	-	-	-	135 „ 5 „

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A yearling ewe, of the Persian stock of Mount Vernon, and Arlington long woolled, sent to me by Mr. Custis, in 1806, sheared the following year, six pounds of washed wool. She was finely formed, her wool eight inches long, and tolerably fine. I sent her in the autumn of 1808 to Mr. Dupont's ram, at Brandywine, and had the misfortune to hear of her death, with her lamb.

These examples will serve to prove the positions laid down above, and are certainly highly encouraging to the American farmer. Numerous other instances have occurred to the author's notice, of fleeces of seven and eight pounds, on American sheep; but it is unnecessary to quote them, as the question must be set at rest by the above statements, respecting the improvement which is in the power of every one to make, by judicious and careful crosses, and by attention to selections from our native breeds.

The ages of sheep are known by their teeth. Lambs come into the world with eight small teeth; when about seventeen months old, two large teeth in the middle of the front of the lower jaw appear in the place of two small ones. In the third year, two more broad teeth, one on each side of the former two, appear. In the fourth year, two more appear, viz. one on each side. In

the fifth year, the two hindmost lamb teeth fall out, and two more broad ones succeed; they are then said to be full mouthed, having acquired eight broad teeth.

CHAPTER II.

MANAGEMENT of a flock.—Age and season of propagation.—Best mode of admitting the ram.—General treatment of ewes.—Food.—Shelter.

FROM the little attention hitherto paid to sheep in most parts of the United States, no regular system has been adopted with respect to the general management of a flock, and in particular to the important points of the proper age at which to make use of the ram, or of permitting the ewes, whether young or old to take the male. All those matters have generally been left to nature, though nothing could be more certain than that she is a very bad guide, and when not controlled, will inevitably do mischief.

In the first place, although an early ram will be able to propagate the ensuing autumn, yet the exertion of his powers should only be permitted in extraordinary cases, such as the wish to possess a particularly fine breed, and even in this case, he ought not to serve more than a dozen ewes, at the interval of three or four days from one another. For general use, the farmer, if he wishes to consult his own interest, must wait until he is at least eighteen months old; but it would be still better to wait until he has attained his full growth, or at least until he is two and a half years old, according to the practice of the French national farm at Rambouillet; the same rule has there been applied to ewes, (by which, and the observance of others to be mentioned hereafter); they have attained to a degree of perfection in the form of carcase, and quantity and quality of fleece, unknown in Spain or any other parts of the world. In England the great improvers never use a ram until he is two years old. By this delay, some little loss of time in the multiplication of a flock will take place, but the delay is of little consequence when compared with the great advantages resulting from it, and of securing a healthy vigorous flock. In

commencing with the costly Merino, the rule is of primary importance, because longevity, health, size, fleece, every thing are connected with it.

In the United States, it is common to permit lambs to take the ram the first autumn following their birth; at that time their constitutions are not fully formed, nor are their organs completely developed; they have not yet attained to their utmost growth, and as all the nourishment the ewe is capable of receiving is requisite for the production of her own vigour, and ultimate size, it cannot be supposed that either will be attained when obliged to part with some of it to her fœtus. The fœtus moreover can only derive from the mother as much nourishment as she can spare from the actual support of her own system, and hence it follows, that by so much will it suffer. Both will therefore feel the effects of this early connexion. The progeny will certainly be of a diminutive size, and the foundation of a puny race be laid, which will greatly diminish the profits of the farmer, whether he depend upon the sale of wool, or of sheep for the market or for breed. Lambs moreover often lose their young in yeanning from absolute inability to expel them*, or from a deficiency of milk. For all these reasons, we ought to restrain the ewes from a connexion before the autumn of the year after they are yeanned, at least.

In the mode of admitting the ram to the ewes, great caution is necessary. If he be turned into a flock he will exhaust himself by repetitions of the act; for ewes do not like cows, immediately reject the male after impregnation, but will admit his embraces during the continuance of the rut. He will besides, reject some and caress others. A much better way, if the ewes exceed fifteen or twenty, is to put a few to him at a time, having previously marked his breast, and between his fore legs withred chalk†: thus it may be known by the stain on the back of the ewes whether he has served them, and the fact being ascertained they should

* Before I was aware that lambs would take the ram, I permitted them to run together, in consequence of which, one required assistance in yeanning.

† The way is to grease the parts, and after scraping the chalk upon them, to rub it in with the hand.

be taken from him. Bakewell's plan was to keep an old ram with the ewes as a teaser, but prevented from exerting his powers, by a cloth sewed round his body: the ewes as they were discovered to be in heat, were brought in succession to his tup ram, which he kept in a pen. In this way a ram may serve seventy or eighty ewes. Whereas, if turned into a flock of that number, he would be exhausted before the end of the season, and might probably die. The flock ought to be in high keep during the rutting season, the ram in particular ought to be full fed*; and besides abundance of grass, should have a gill of indian corn daily. By the lambs coming in succession, an opportunity will be offered of paying greater attention to the ewes and lambs, (whose weakness or indisposition, may require particular care) than if many were lambd at the same time, an event which always happens, when no precautions are taken. The time of admitting the ram, must be regulated by circumstances;—if very early lambs for the market be the object, the ram may be admitted at a more early period, but if only the increase of stock, the nearer they come to grass the better, for no food we can provide, equals that substance in increasing milk, and consequently promoting the growth of lambs. Proceeding upon this principle I make it a rule to have my lambs to drop in March and April. A ewe goes one hundred and fifty days with lamb: by attention to this fact, we may provide against her yeanning should the udder fail to announce the approach of her time. The flock should be driven to a shed open on one side, or into a log house or barn every night, and in the day time in stormy weather, from October to May; and previous to lambing, the ewes should be housed, and at all times well littered with clean straw. Their health is thus promoted, their lives secured from their most inveterate enemies DOGS, and a quantity of the best manure made. Hay may be given them in *upright* racks, from both sides, having a trough below for salt, potatoes, turnips, &c.

* A moveable fold might be used to pen the ram, which should be moved upon fresh rich grass every day. A couple of ewes out of heat may be put in with him to prevent his becoming uneasy from solitude, for sheep love company.

The first visits of the farmer in the morning should be to his flock: the lambs that may have dropped during the night, must be removed for a day or two to an out house, or other inclosure or pen, in order to enable him to know whether the mother reject the lamb, or permit it to suck freely. In the former case, the ewe must be tied by the head, and kept with her lamb in a dark place, and to insure a due supply of nourishment for the first few days, the lamb must be regularly presented three or four times daily to the teats of its mother. It very seldom happens that a ewe will reject a lamb intirely, but should this happen, the lamb must continue confined with its mother and suckled regularly, until taught to drink milk from a bowl or wooden dish; it must then be raised by hand.

“Should any deformed or lame lambs be found in the flock, or should any one be killed by accident, strip off the skin from such lamb, and cover with it either a twin lamb, or the lamb of a young ewe who does not appear to be a good nurse, and shutting up the ewe that has lost her lamb, she will generally take it as her own*.” This expedient which, as Mr. Livingston says, is common in Spain, has been recently adopted by Mr. Du Pont, with success, and the life of more than one valuable Merino saved thereby.

It will amply repay the trouble, if the lambs, of weakly mothers be taught, and it may be easily done, to lick a little Indian meal every day.

As one of the surest means of preserving the health of a flock, of procuring the heaviest fleece which the nature of the breed will admit of, and a uniformity of staple, a due supply of good food at all times is essentially necessary.

The farmer must not expect to find his flock, and particularly his lambs improve, if they are stinted at any time, and especially in the winter, when the ewes will require a full portion of juicy strengthening food to convert into milk: and to support them under the exhausting effects of suckling. For this purpose pumpkins, potatoes, and turnips should be provided. It will

* Livingston on Sheep, p. 84.

form an easy duty of an evening, for one or two of the family to cut up a sufficient quantity for the succeeding day's demand.— Few farmers sow turnips as a fallow crop in the United States, although they constitute a regular and indispensable item in the rotations of the most improved English husbandry. But there can be no doubt of their utility as a covering crop; and of the advantage which would be found from the adoption of the practice. Of late it has been more than once recommended, in our public prints to sow them among Indian corn, and some favourable results have been stated of the practice*; but considering their known attachment to rich ground, I question whether they will succeed in this way, unless the manure has been put upon the corn ground, a practice which is adopted by some of the best farmers in New-Jersey. I tried them four years since, in a land which brought me good corn, but without success. The hay I constantly reserve for them is the fine soft natural green grass, (*Poa viridis*) cut before the seeds ripen, which I find they prefer to clover, and which is also preferable because it does not crumble, and thus injure the wool, like the latter, when it happens to fall on the sheep.

Besides the articles just mentioned, I have used with advantage, flaxseed jelly, mixed with the blossoms and leaves of clover collected from the horse mangers or entries of the barn, and by way of change with wheat bran. This jelly is easily made, by means of a boiler fixed in the top of the close stove which warms the farm kitchen. I tried oats softened by hot water, which water also was given to them by way of drink, but I discontinued it after two weeks; as the bellies of the ewes appeared to be drawn up, and I thought from the more frequent sucking of the lambs, that the milk was diminished; a relaxing diet is certainly more favourable to the production of milk. Where oil cake can be procured, a pound or two of it in powder, mixed with a proper proportion of bran and water, and given once a week, will be found highly useful in strengthening the ewes, and in pro-

* I have regularly put in from one to two acres, which have afforded me a profusion for all kinds of stock, and abundant supply for my ewes and other sheep, until grass. They were drawn and preserved in dirt pyes.

moting a flow of milk. About nine or ten o'clock in dry weather, all the flock except the ewes recently yeaned, should be turned out in a field where they can obtain water, or they should be driven to a stream. Even when snow covers the ground, they must be turned out, for two or three hours for exercise, and to air their pens: they will greedily eat the snow, which will supply the place of water. In such weather I have adopted with advantage, the Swedish practice of giving them occasionally, cuttings of cedar, pine, and other resinous trees. Hay or corn blades may be given in the middle of the day, in the field without danger of being soiled or wasted, in trumbrils or circular cages, made of willows*, which are easily removed to a fresh spot. Taking the hint from my Spanish sheep, I have always followed the practice of docking the tails of my lambs, to prevent the accumulation of filth, which will fatigue them to carry, and according to the late experienced Mr. Capner sometimes cause the dislocation of their back bones†. For the same reasons, it is indispensably necessary to trim the tails and upper parts of the thighs behind, before turning out to grass.

In the spring of the year, before grass springs, it would conduce greatly to the health of both the mother and lamb, to turn them every day for an hour into a patch of rye sown for the purpose early in the preceding autumn. Besides the good effects resulting from it as a change of food, the succulency of the rye will promote a flow of milk, an object which should constantly be before the eye of every farmer. When all the crop is consumed, the field, which will be much enriched, may then be profitably cultivated in any way most desirable. Every American farmer knows the benefit of salt to cattle, and will not forget to give it

* A trumbril may be ten feet in circumference, and closely wattled to the height of one foot, above which it is left open for the space of eighteen inches; when it is again wattled to the height of eight or nine inches; an opening is left at top, for the purpose of putting in food. The staves which form the skeleton of the machine, are ten inches apart, so that twelve sheep may feed at each trumbril. A cut of it is given in the Domestic Encyclopædia.

† See Memoirs Agricultural Society of Philadelphia, vol. 1.

occasionally to his sheep. The attentive farmer will of course at any early period mark his ewes and their progeny, so that he may know the relationship between them, and the degree of blood derived from his ram; he will castrate within two weeks all such ram lambs as he does not wish to preserve as breeders for himself, or for sale: he will turn off all ewes in a declining state, or those of inferior breeds, that missed taking the ram; and will wean the lambs at a period sufficiently early to enable the mother to recruit her strength from the exhausting effects of suckling; and secure an abundant supply of pasture for them on the approach, and during the continuance of the season of heat. He will separate the wethers from the ewes, to prevent the latter from being driven away from food: and daily inspect his flock to watch the approach of disease, apply without delay the proper remedy, and separate the sickly, or diseased in any way, from the well. Suckling ewes in particular require the most minute attention. Their udders often swell and inflame, especially in the event of the death of a twin lamb; the side of the udder which the deceased lamb had sucked will then become hard and painful, and sometimes cause a fever, and even the death of the animal. I have to regret the loss of a ewe and also a fine ewe-lamb from such an event; all attempts at raising the latter by hand proved ineffectual. In such cases the udder should be bathed with warm water and soap, three or four times a day, and *stramonium** ointment applied morning and evening to the whole surface, and gently rubbed in.

CHAPTER III.

Times of shearing different in sheep, necessity of attention to the point.—Washing, caution requisite.—Improved mode.—Separation of wool of different age and sexes necessary.—Utility of salving sheep.

NATURE points out the most proper time for shearing, by the protusion of the old fleece, and the growth of the new wool un-

* Jimson or James-Town Weed. The ointment is made by bruising the leaves, and simmering them gently over the fire, with hog's fat:

derneath, the line of demarkation being very visible. As this separation, however, takes place in the individuals of every flock, except those of the Merino breed, at various times, from the influence of causes operating upon the animal, and even before the warmth of the weather would seem to make it advisable to relieve them from their fleeces ; it is necessary to examine the flock every week after the first of March, and to shear such as begin to shed their coats : otherwise the old fleece will be matted or cotted, and cause much difficulty in picking and carding ; and the length of the young wool will be shortened by the delay. It will be necessary to house such for a few days after shearing, to prevent the chance of taking cold ; and even for sometime after they ought to be sheltered every night, and also in the day time in stormy weather. With this little care, no danger will attend an early shearing, as I know by my own experience, having been obliged to relieve several American and Dishley ewes from their fleeces some weeks before my general shearing, without any injury ensuing to their health. Previously to shearing it is common to wash sheep in a river, or creek, as it lessens the trouble of the operation, and prevents the necessity of so frequently sharpening the shears, as is required when the dust is left in the wool. This business is too often a cause of frolic upon a farm ; and as in such cases, care is laid aside, some remarks are necessary to prevent accidents even when most tenderly performed. Washing is a fatiguing operation, water being an unnatural element to sheep ; but when they are roughly handled, it is painful and a source of danger, especially to weakly sheep, or to ewes that lamb late, and that may not have yeaned at the time. I have known an old ewe, feeble, but without particular disease, and having a fine lamb, expire after coming out of the water, in consequence of long and rough handling, and two or three submersions of the head. *Upon this and all other occasions*, farm servants should be cautioned against seizing the sheep by the wool of any part of the body. I have known a handful of wool, in the spring of the year, left with a rough fellow, who seized a strong sheep by the back. They may be caught with the right hand by the hind leg, above the hough, but not drawn back-

wards ; the left hand then being passed under the throat, the right hand is to be placed behind the tail to push the sheep along.

A stream with a clean bottom is generally chosen ; but the tail of a mill race is much preferable, for the animal may be kept free from fatigue, in one place, by two men, while clean water is continually passing through the fleece, carrying with it every particle of dirt. The fleece should be pressed and squeezed to loosen the dirt while the sheep is in the water, and also after they come out, to expedite the drying of the wool ; they may then be driven home in the evening, or early in the morning, to avoid dust, and turned to pasture.

When properly performed, shearing is a neat operation ; and after the fleece is taken off and spread out, every part of the animal may be accurately designated. Great improvements have of late years been made in England, in the process of shearing, by clipping round the animal instead of lengthways. The present method, according to Cully, is as follows :—"Begin at the back of the head, in order to give room for the shears to make their way down the right side of the neck to the open of the breast. The man then sets down upon his right knee, laying the head of the sheep on his left knee, bent, and beginning at the breast, clips the under side of the throat upwards to the left cheek, then takes off the back of the neck, and all the way down below the left shoulder ; he then changes to the contrary side, and makes his way down to the open of the right flank,—this done, he returns to the breast, and takes off the belly, after which it matters not which side he clips, because being able to clip with either hand, he meets his shear points exactly at the middle of the back, all the way, until he arrive at the thighs and legs : he then places the sheep on its left side, and putting his right foot over the neck, and the other forward to the undermost hind leg, clears the right side : then turning the sheep over finishes the whole."

Mr. Price (*Annals of Agric.*) describes the process thus :—"It commences with the shears at the crown of the sheep's head, with a straight cut along to the loins, returning to the shoulder, and making a circular shear around the off side to the middle of the belly : the off hind leg next ; then the left hand holding the tail, a cir-

cular shear of the rump to the near huck of the sheep's hind leg : the two fore-feet are next taken in the left hand, the sheep raised, and the shears set in at the breast, when the remaining part of the belly is sheared round to the near stifle : lastly, the operator kneeling down on his right knee, and the sheep's neck being laid over his left thigh, he shears along the remaining side."

Young shearers are obliged to have the legs of their sheep tied, and to place the animal upon a table, or board raised from the ground. But expert operators require no ligature, nor do they raise the sheep from the ground or floor. My flock were in this way shorn last year by an Englishman, who gave me great satisfaction. About one dozen sheep at a time were driven into a moveable fold under a tree, while the rest were grazing in the adjacent orchard : a boy cut off the tag-locks, and handed the sheep as wanted. He performed upon the American and Dishley ewes with expedition ; that is, turning off twenty-five per day ; but when he began with the Merinos, he immediately perceived the difference, the shears entering with difficulty the closely matted fleeces, and I was obliged to restrain his eagerness to finish the task, from a fear that he would wound some of them with the shears, an accident which in fact happened, in two or three instances. A shady pasture should be provided for the flock after shearing.

The wool of rams, wethers, ewes, and yearlings, should all be kept in separate parcels ; and to prevent mistakes, a ticket or a small tally, with an appropriate mark to designate each sort, may be attached to the fleeces. In the case of Merinos, the degree of blood of each fleece must also be attended to, and noted for the benefit of ourselves or of the manufacturer ; for the wools of different ages and sexes have different capacities of fulling, and in order to insure a uniform piece of cloth, wool of the same denomination in all respects must be used. The fleece when taken off must be wound up with a band, made from the wool of the hind part, gently pulled and twisted.

The practice of anointing sheep with mineral and unctuous substances, after shearing, is of high antiquity, being recommended by Virgil (*Geo. lib. 3.*). The object in those days was merely to cure diseases of the skin. But greasing wool has been found

in certain situations, and in certain breeds, to produce excellent effects; the practice therefore deserves attention from those who are anxious to improve. Thus, where sheep from their numbers, or want of conveniencies, cannot be housed in winter, a mixture of tar and butter applied in the autumn to the skin, resists the injurious effects of cold rains, kills ticks, (*hippobasca ovina*) prevents or cures the scab, promotes the growth, and softens and refines the staple of the wool. The usual proportions in England are sixteen pounds of butter (hogs fat would probably answer) to one gallon of tar. The butter is first to be melted, the tar added, and the mixture stirred with a stick, until the two substances are well incorporated, and form a soft tenacious ointment. The mode of applying it, is to divide the staples with one hand, and apply the ointment to the skin with the finger of the other hand; in this way the ointment is kept constantly soft by the warmth of the skin, and is equally diffused through the fleece. The above quantity will suffice for fifty sheep. The only objection to salving is the stain left by the tar on the wool, which is so difficult to be extracted in scouring, that it is rendered unsuitable for bright dyes or white goods, and hence Mr. Bakewell, a professed wool stapler, who warmly espouses the practice, proposes the substitution of bees wax, and if any tar be used, advises no greater proportion than one quart to ten pounds of the mixture: to obtain all the advantage of the unguent, both to the wool and sheep, it should be applied immediately after shearing, and again at the approach of winter. By the first grease, the wool will be covered and defended from the injurious effects of the action of the soil, and it will be kept soft and moist during the parching heats of July and August. The upper part of the staple, moreover, will not be harsh and dry, as is the case with ungreased wool, and which is commonly cut off and thrown away. The second application may be in November, when the ointment must be laid close to the skin in regular lines, and well rubbed in. A confidential person ought to be employed on this occasion. If wax be not at hand, and tar objected to, turpentine might probably be used with success. This ointment is a substitute for the natural yolk of sheep, with which our native American sheep are

very deficient, and is particularly necessary to be applied in the southern states, to counteract the injurious effects of a vertical sun, especially after shearing, upon the fleece. Merino wool abounds so much with yolk, that the second application of the unguent may not be necessary, but some unctuous substance ought certainly to be applied after shearing, to prevent the injurious effects of the sun, on the young wool.

CHAPTER IV.

OBSERVATIONS ON Merino sheep.—Origin involved in obscurity.—Various opinions.—Probable one given.—Forms of various flocks.—Divisions of wool.

THE origin of the Merino race of sheep is involved in much obscurity. Lasteyrie says, the word Merino, according to a Spanish writer, is derived from *Marinos*, because the breed came from beyond sea. It is probable therefore, that it is not a native of Spain. The English have long contended for the honour of either having originated the breed, or of greatly improving it by the admixture of the Cotswold breed : but Doctor Parry, after a very laborious, ingenious and learned investigation* of the subject, declares, that the notion, however flattering to national pride, falls to the ground as soon as it is coolly and deliberately investigated.

The French† assert, that this race was formed about the time of the emperor Claudius, from a cross between fine woolled African rams imported by Columella, uncle of the agricultural writer of that name, with common ewes ; and that after having been lost for thirteen ages, Don Pedro, of Castile, in 1350, renewed the experiment by importing Barbary rams and ewes, a measure which was followed up by cardinal Ximenes, in the beginning of the sixteenth century. Doctor Parry however, plainly shews, by the original quotation from Columella, that his meaning was misrepresented by the French writer : for “ the Barbary rams had coloured coarse wool, and the Tarentine ewes to which he put them, were celebrated for their fine fleeces :” so that if any change did take

* These epithets are not wantonly bestowed, but justly merited : it is rare to see any obscure fact investigated with more ability than the notion of the origin of the Merino race in England, by Doctor Parry.

† Folio Encyclopædia.

place it must have been derived from the mothers ; and further, " that no Don Pedro the fourth, king of Castile, ever existed : and lastly, that all historians are silent on any importation of sheep from Barbary by cardinal Ximenes, who himself asserts, that in the attack, by him, in 1509, upon the Moorish city of Oran, he gained no personal emolument, except a few Arabian manuscripts, and some other curiosities." The statement by the French Encyclopædists has been unfortunately copied by many subsequent writers. But the above facts resulting from the original quotation of the passage referred to in Columella, show its incorrectness.

From several coincidences of practice, suggested by similarity of circumstances, and from several important particulars, as of form, fleece, constitution, general treatment, &c. in which they agree, and which are detailed with great accuracy, Dr. Parry is induced to believe that the present Merinos are the same as the ancient Tarentine sheep of Apulia. The determination of the question may not be attended with any practical utility, but this concise abridgment of the various opinions on the subject was thought worthy of a place, and it is hoped will not be found devoid of interest.

The common form of this race in Spain, is not a model of symmetry or of just proportion ; being often high on the legs, with large heads and long necks, narrow chests and somewhat flat sided. They are in general also below the common size of sheep : in these respects a great difference is observable in the same flock, and in the different flocks bearing the name Merino, in Spain.— They are capable of great improvement, and the effect of attention to this object is evident from the plate prefixed to this work ; and from those which have been bred in the United States. The skin is soft, thin, and loose, qualities well known to be connected with a disposition in other animals to speedy fattening. It is also of a rosy hue, or carnation colour. This tint is particularly conspicuous in the eye-lids and eyes. More parts of their bodies are covered with wool than any other breed of sheep ; it exists on their foreheads approaching the eyes, on the cheeks, on their bellies, on their hind

legs, and sometimes their fore legs, down to their hoofs*. The rams generally have large spiral horns, the ewes of the full blood are hornless or polled; but the half, three quarter, and seven-eighth bloods frequently have horns.

The length of the staple is from two to somewhat more than three inches; and in the best breeds is much alike on the shoulders and on the thighs. The wool of the ram is generally esteemed the coarsest and longest; that of the ewe finer and shorter, and that of the wether, in both respects between the two former. The common produce of unwashed wool in Spain is 5 lbs.; the fleece should be free from white coarse hairs, called by the French *jarr*, and by the English *kemps*, *stichel hairs*, or *cat's hairs*. Those which here and there occur among the Merino wool, are very short, and easily drop out during the process of manufacture, so as not to injure the fabric.

There are a great number of Merino flocks belonging to different proprietors, who are chiefly *grandees*, or societies of monks; and, as just observed, differ in form, size, and in weight and fineness of fleece. A few shall be mentioned.

Monastery of Paular,
Escorial, or Patrimonio,
Guadeloupe,
Negrette, or Campo Alange,
Muro,
Infantado,
Leon.

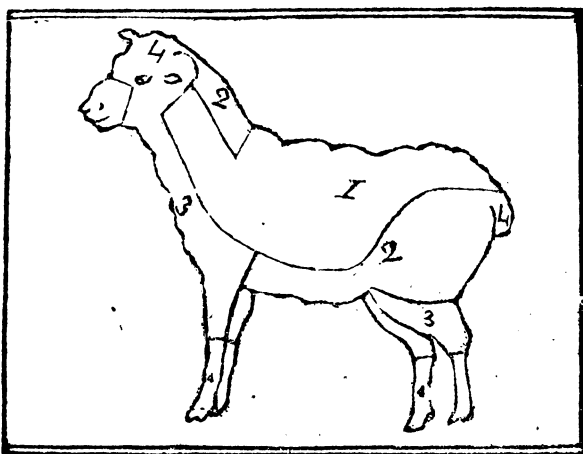
Lasteyrie says, that it was from the Negrette stock that those came, which were presented to the king of England by the king of Spain, in 1791; they possess the largest carcasses, the heaviest fleeces, and the finest pile of any of the breed, and together with the piles of Paular, Negrette and Escorial are retained for the royal cloth manufactory at Guadalaxara. Burgoanne confirms

* This peculiarity is so common, that unless a sheep, called Merino, is thus clothed in wool, a suspicion is entertained among us, of a deception. This only shews how liable we are to commit mistakes. A late imported ram, now in the possession of J. A. Smith, Esq. of Black-Point, New-Jersey, has no wool on his legs, and yet a manufacturer has offered 2 dolls. 67 cts. per lb. for his wool. Don Pedro has also, very little wool on his legs.

this statement. The flock of Guadeloupe are the best proportioned, and are equal to any in the weight and fineness of fleece.

The wool of the Merino lamb in general is evidently coarser and harder than that of the sheep. Different flocks vary in this respect. The lambs of the Infantado, Paular and Negrette race, are covered with a coarse sort of hair which changes into very fine wool. The old sheep keep their teeth longer than other breeds; even to the ages of 14, 15, 16 years, according to the statement of Mr. Pictet of Geneva; and several instances are mentioned of ewes of the above ages, bringing forth lambs.

The wool is divided by the Spaniards into four parts:—The first, which is called *Refina*, and by the French, *Laine-Mere*, is taken from the flanks, as far back as the tail, the shoulders and sides of the neck. The second, or *Fina*, comprizes the wool of the top of the neck, the haunches as far as the line of the belly, and the belly itself. The third, or *Tercera*, is that of the jaws, the throat, the breast, the fore thighs to the knees, and the hinder thighs to the line of the belly down to the hocks. The fourth, or *Cahidas*, is that below the hocks, between the thighs, the tail, the buttocks, the pole and behind the ears, and all that which shakes out of the fleece in shearing, or in washing. In the cut annexed, from Lasteyrie, the parts of the sheep which furnish the wool of these respective qualities, are included within the corresponding lines, and indicated by the figures 1, 2, 3, 4.



CHAPTER V.

WEIGHTS of fleece.—Live weights.—Loss of wool in scouring.—Proportion of cloth to wool.—Mode of improving quality of wool.—Mode of counting degrees of blood of a ram.—Washing Spanish sheep improper.—Mode of washing wool.

THE weights of fleece in the Merino breed are various. This diversity is owing to the sizes of the animals, and the regular keep, winter and summer. In Spain, according to Lasteyrie, and as already noted, they average 5 lbs. In Mr. Tollet's flock, in 1804, the average weight of each fleece in the yolk was 6 lbs. 6 oz. The yearlings, 4 lbs. 5½ oz. each. The lightest ewe fleece weighed 3 lbs. 4 oz., and the heaviest ram fleece, 11 lbs. 12 oz., at thirteen months old. He was laid at 20 lbs. the quarter. The fleeces of the rams weighed generally 8 lbs. 2 oz. That of Mr. Livingston's full blooded ram, Rambouillet, imported from France, weighed 9 lbs. Clermont, fourteen months old, (1809), 9 lbs. 6 oz. Columbus, and Hornless, 6 lbs. 7 oz. The latter three were yeanned in the United States; his ewes from 4 to 5 lbs. Mr. James Caldwell's ram Columbus, two years old, from a ram of Mr. Miller's, and a ewe of Col. Humphreys' sheared the present season, 9 lbs. unwashed wool. A ewe, same cross, 6¾ lbs. Another ewe of Humphreys' stock, 5¼ lbs., all unwashed, but wool clean, the sheep having been kept on grass ground. Mr. B. Cooper's Spaniola, seventeen months old, from Mr. Caldwell's stock, sheared (1810), 12 lbs. Dr. Parry says, he has known the fleece of the same ram vary in two years, from 7 lbs. 9 oz., to 5½ lbs. This especially takes place after the teeth are so much injured by age, as to prevent the animal from feeding; for it is universally found that the quantity of wool is, within certain limits dependant on a sufficient quantity of wholesome nourishment. This however was not the case with the ram mentioned. The weight of fleece may be naturally expected to increase till the animal has reached his full size: which is not before he has six teeth, or between three and four years old: and it certainly diminishes as he grows old. To this cause must be attributed the decrease of the weight of the fleece just noted. Ten rams of different ages, from four teeth up-

wards, sold to Mr. Birkbeck, by Dr. Parry, gave 97 lbs., or nearly $9\frac{1}{2}$ lbs. each. Two gave 11 lbs. 15 oz. each, and one, (the finest) 12 lbs. A ram of Mr. Pictet, of Geneva, weighed 12 lbs. 13 $\frac{1}{2}$ oz. The ewes of the same gentleman, averaged 6 lbs. 8 $\frac{1}{2}$ oz. The two-tooths, give more than 9 lbs. 13 oz. of unwashed wool. One of his rams, of the same age, gave a fleece weighing 14 lbs. 13 oz.* Of the flock at the national farm, at Rambouillet, in 1797, the average weight of the fleeces in yolk was 7 lbs. 8 $\frac{1}{2}$ oz. In 1802, the fleeces of the adult ewes averaged 9 lbs. 13 oz. Of the rams of three or four years old, 11 lbs. 5 $\frac{1}{2}$ oz. each. The weight of some of the rams was nearly 8 kilogrammes, or 18 lbs. 5 $\frac{1}{2}$ oz. each, unwashed.†

The live weights of the Merino race, differ as much as their fleeces. They are alike influenced by the same causes. No one who keeps his flocks upon half allowance, can expect, with the least reason, that either fleece or carcase will arrive to their ultimate weights. A difference however, will be in part occasioned by the nature of the original stock from which the ram came, but more upon the size of the ewes selected to breed from, and whose influence is too commonly overlooked by those who have attempted to improve. In the case of the Merino it has been accurately ascertained, that it is from the sire, an amelioration of the fleece is to be expected, and by the mother that the form is enlarged or changed. From an early conviction of this point, and an anxiety to unite beauty of form with fineness of fleece, I have ever made the selection of ewes a chief object, and have taken the pains to bring Dishley ewes from New-Brunswick, New-Jersey, to cross with Merino rams, the beauty of their forms being unquestionable. The result has answered my expectations. In like manner, Mr. Livingston, by attention to this circumstance has greatly improved his Merino flock in size and beauty.§ “I had, says Dr. Parry, a strong confirmation of this last year, when the lambs got by my finest woolled ram, which was not well shaped, and smaller

* Pictet Faits et Obs. sur les Merinos.

† Lasteyrie, Histoire de l'introduction des Moutons a laine fine, D'Espagne, &c. p. 56.

‡ Comm. to board Agric. vol. 5, p. 537. § On sheep, p. 121.

than most of the other males, turned out to be larger and better formed than the generality of my other stock. The same thing happens in other animals."*

Mr. Livingston's ram Rambouillet,	} wt.
(1809),	} 140 lbs.
" " " Do. (1810)	155 — with his fleece.
" " " Clermont, (1809)	126 —
" " " Columbus, "	123 —
" " " Hornless, "	122 —
Mr. Caldwell's ram Columbus,	145 — sheared.
" " " $\frac{1}{2}$ blood 5 m. old,	} 87 —
(July 1810),	}

Mr. Cooper's Spaniola, " 112 — washed.

Of my own flock I shall speak presently.

As it may be useful and at least satisfactory to the American clothiers, to know the amount which Spanish wool loses after washing, the following statements are given.

1. King of Englands flock ;—100 ewes and wethers—9th of June, 1800.

Wool washed on the sheep's back,	398 lbs.
Loss in scouring, - - -	104 —
Amount of scoured wool, - -	294 —

Which produced when sorted

Prime, or Refina, - - -	234 —
Choice, or Fina, - - -	34 —
Fribbs, or Tercera, - - -	26 —

2. Same flock, 1801—108 ewes and wethers.

Wool washed on the sheep's back,	397 —
Loss in scouring, - - -	112 —
Amount of scoured wool, - -	285 —

Which produced when sorted,

Prime, or Refina, - - -	237 —
Choice, or Fina, - - -	31 —
Fribbs, or Tercera, - - -	17 —

The wool of the rams and fatting wethers which had been kept separate :

* This subject shall be more fully explained in a future number.

Wool on the sheep's back, - -	220 lbs.
Loss in scouring, - - -	82 —
Amount of scoured wool, - -	138 —
Which produced when sorted,	
Prime, or Refina, - - -	96 —
Choice, or Fina, - - -	30 —
Fribbs, or Tercera, - - -	12 —
The pelt wool of 11 fat wethers, sold in Newgate market, was taken off, and weighed in the yolk:	
Amount of wool, - - -	36 —
Loss in scouring, - - -	8 —
Amount of scoured wool - -	28 —
Same flock, (1802), 96 ewes.	
Shorn, - - -	352 —
Loss in scouring, - - -	96 —
Amount of scoured wool, - -	256 —
Which when assorted produced,	
Prime, or Refina, - - -	221 —
Choice, or Fina, - - -	32 —
Fribbs, or Tercera, - - -	3 —*

The wool of the Rambouillet flock wastes more than two-thirds in scouring: lord Sommerville's, one-half: in Spain, two-thirds: 356½ lbs. of Mr. Tollet's flock, were reduced by washing, to 184 lbs., and when purified by clean scouring, this wool, like best Spanish would be reduced to 152 lbs.

Thirty-six and an half pounds of Refina in the yolk, became, when picked and dyed blue, 48 lbs.—76½ Refina in the yolk, were reduced to 44½ lbs. when dyed blue, or about 43½ lbs. undyed.† 32½ lbs. of the same wool became, when picked and scoured, 19 lbs.

From the above, and various other statements, it appears that the Refina wool wastes considerably less than half. Fina, and inferior sorts, about half. Upon the whole, Dr. Parry concludes, that, "if a Merino, Ryeland flock, of the finest wool, be carefully attended to in feeding, shearing, and if the operation of scouring and picking be skilfully and faithfully conducted, the total re-

* Reports of the state of His Britannic Majesty's Spanish flock, by Sir Joseph Banks, for 1800, 1, 2. † Dr. Parry.

duction cannot amount to half the original weight of the gross wool in the yolk.*

As to the extent of the wool the produce of a Spanish ram, and Ryeland ewes, Dr. Parry gives the following facts :—

Forty-six pounds and three quarters made $29\frac{1}{2}$ yards of cloth.— $46\frac{1}{2}$ lbs., $30\frac{1}{2}$ yards.— $44\frac{1}{2}$ lbs., $28\frac{1}{2}$ yards.—42 lbs., $26\frac{3}{4}$ yards. The whole produce $179\frac{1}{2}$ lbs. made $114\frac{1}{2}$ yards. Sixty pounds of Spanish wool, make 30 yards. The same quantity of Doctor Parry's Merino Ryeland wool made $26\frac{3}{4}$ yards, or about one pound nine ounces to the yard. He concludes, that this cross goes farther in the fabric than an equal weight of the best Spanish in the same state, and therefore is, in that respect, more valuable to the manufacturer.† But Mr. Livingston says, that a yard of cloth was made at Clermont, by common country spinners and weavers, from 1 lb. 4 oz. of Clermont Merino wool: and $32\frac{1}{2}$ yards of twenty-five and an half inches wide, were made in Edward P. Livingston's family from $16\frac{1}{2}$ lbs. of wool.‡ These facts are highly flattering to the American improver and the manufacturer: for we must suppose that in proportion to the perfection of our machinery, and of the whole process of the manufacture, the wool will go still farther; and in the case of cloth from ten to fourteen dollars per yard, the difference of half a yard in a piece, is an object well worth attention.

The loss in scouring and picking the wool, will be less in proportion to the cleanliness of the sheep: and hence the greater necessity for attention to that point.

The only mode to improve wool to a desired degree of fineness, is to put such rams to the ewes as possess that quality of wool which we wish to transfer to our flocks. The finer the wool of the rams are, and the more perfect their shapes, the sooner will the object of the breeder be obtained; for although the form of a breed depends greatly in all cases upon the female, yet both parents have an influence, and therefore their forms should be attended to.

* Seventy-two pounds of selected lambs wool, by scouring and picking was reduced to 42 lbs., and made 28 1-2 yards blue broadcloth, dyed in wool. p. 459.

† Comm. Board Agric. vol. 5, part 2d. p. 449.

‡ Comm. &c.

p. 452.

The following is the rule for determining the proportion of blood infused into a flock by a ram.

Suppose the ram, the fineness of whose wool we wish to incorporate with our flocks, to be designated by the figure 1, and the ewe by 0,—the lamb will of course partake of one half the qualities of the sire, and one half of those of the dam: the lamb consequently will be related to its sire as $1+0=\frac{1}{2}$, that is to say, it will share in one half of the qualities of the sire.

In the second cross, the ram will still remain 1, the lamb produced from the first generation will remain in its qualities half; it follows that the lamb produced from $1+\frac{1}{2}$ will be equal to three quarters of the qualities of the sire.

In the third generation, the ram will still remain 1, and the ewe to be crossed remain three fourths, the offspring of this couple will possess seven-eighths of the qualities of the sire.

Finally, in the fourth generation, the ram will still be 1, and the ewe to be put to the ram be seven-eighths, it follows that the lamb from the fourth generation will partake fifteen-sixteenths of the qualities of its sire, and if the ewes have been well selected in the first cross, the difference between the ram and his progeny, will be scarcely if at all perceptible.

The following is another view of the subject:

Suppose common sheep to stand to the Spanish breed as 0 to 1, and the experiment to begin in 1810, the progeny will then not arrive at full proof until the spring, 1817. The produce is supposed to be ewes, and not to be put to the ram until the second autumn after their birth, say seventeen to twenty months old, or having two large teeth.

0	Common breed,	}	October, 1810.
1	Spanish ram,		

$\frac{1}{2}$ Or first cross, March, 1811.

.....

$\frac{1}{2}$	Breeding ewes, 1st cross	}	October, 1812.
1	Spanish ram,		

$1\frac{1}{2}$ —

$\frac{2}{3}$ Second cross, March 1813.

$\frac{3}{4}$ Second cross,
 1 Spanish ram,
 } October, 1814.

1 $\frac{3}{4}$ —
 $\frac{7}{8}$ Third cross, March, 1815.

.....

$\frac{7}{8}$ Third cross,
 1 Spanish ram,
 } October, 1816.

1 $\frac{7}{8}$ —
 $\frac{15}{16}$ Fourth cross, equal to full blood, March, 1817.

At present, full blooded rams are not within the power of every one, and therefore many are obliged to begin the improvement by half, three-quarter, or seven-eighth rams. This is proper, because, it cannot but follow, that the produce of such rams will be an improvement upon a flock, proportioned to the quality of the ram, and the fineness of the ewes put to him. In this case, ewes should be selected with more care and attention to wool, than if a full blood were in our power, because less improvement is to be expected; and therefore advantage should be taken of the little which the ewes will impart to their progeny. The same ram, however, ought not to be put to any of his progeny, with a view to improvement, but new ewes be chosen; nor ought a ewe used for the first cross, be put to a ram from the same cross, because it will be putting 0 to $\frac{1}{4}$, and the lamb produced by this couple will only have a quarter the fineness of the sire's wool. If, moreover, a ram of this cross, say one fourth, is put to a common ewe, equal to 0, the lamb will inherit of its original sire's qualities, no more than one-eighth. Thus, the line drawn between the sorts, to which the ram and ewe belong, becomes gradually more prominent, and the two breeds which were intended to be mixed together in their properties, begin to separate and to return to their former state. Where, however, rams and ewes of the same cross couple, the improvement will only stop, and if attention be paid to the preservation of the health of the animal, and to the keeping up a supply of good food, no diminution in its quality will take place, an event which every one will naturally wish to avoid.

Dr. Parry objects to washing the wool on the sheep's back. The fleece he remarks, is so thick, that when soaked in the water,

it is very long in drying, and if the weather prove wet and cold, the sheep is incommoded. The wool, he remarks also, in full yolk, might be kept longer without danger from the moth. Both these reasons are of considerable weight; but two other powerful ones against washing it on the sheep's back, are, the impossibility of fully cleansing it of the yolk, and the probable injury which the wool would in consequence sustain. The difference of trouble to the shearer, between unwashed and washed Merino wool, is but trifling. Mr. Livingston, moreover informs me, that he is now convinced from several trials, the finest thread may be made of unwashed wool, as hinted in his useful book (p. 155), and recommends not to wash it before being carded and spun. The wool must however be carefully picked, and freed from all hay seeds, dirt and motes, and opened perfectly before it is carded.

In confirmation of Mr. Livingston's opinion, as to the advantage of spinning Merino wool in its natural grease or yolk, without washing, I may mention the following fact from Mr. Board, Director of the French national dyeing establishment.* "On comparing wool spun in the grease and afterwards scoured, with that scoured before it was spun, it appeared that the former had become exceedingly white, resembling the colour of unwrought cotton, while the latter retained a dull yellow cast, from which it can never be freed. This last experiment frequently repeated, and in several different ways, constantly afforded the same results. It agrees with the ideas current in the work shops, that wool badly scoured, can never be thoroughly cleansed from yolk, and that a great part of the preparations it may receive in dyeing are never fixed in a solid manner."

Where a flock is small, there can be little difficulty in preserving their fleeces so clean as to enable a spinner to card and spin the wool without washing; but in large flocks, the fleeces will acquire so much dirt in the course of a year, as to render it necessary to wash the wool before being made up. For this reason the proper mode of washing shall be given at length, because if done at all, the beauty of a piece of cloth will depend upon the perfection

* *Annals de Chimie*, No. 158.

of the operation. I shall give the French method as translated by Parry, from Gilbert's work on sheep.*

The washing, if possible, ought to be done before the middle of October, as after that period, the water employed in washing, would cool too soon: and the shortness and coldness of the days, would make it difficult to dry the wool. Each sort of wool must be separately submitted to the following operations:

On the evening of the appointed washing day, open the wool carefully, and spread it on hurdles, supported by tressels, beat it gently with two small sticks tied together, shake it well to separate the dust, and particles of hay, straw, &c. If any parts of the fleece are entangled, they are to be opened with the fingers, or with a fork in each hand, having short crooked fingers of metal.

The wool is then to be thrown into one or more tubs, proportioned in size to the quantity which is to be washed. When they are full, the wool may be well pressed or trodden in, and water is to be poured on it, heated to about the 144th degree of Fahrenheit's thermometer, till it reaches the top of the vessel. In this manner the wool must steep for at least eight or ten hours; or it may remain even twenty-four hours, if convenience require it.

The water thus impregnated with yolk is not to be thrown away, but is essential to the operation of washing. When, therefore, the wool is taken out, as much of it as possible should be allowed to drain back into the tub.

One or two boilers, according to the quantity of wool to be washed, are now filled about two-thirds full of this yolk-water; which is gradually warmed till it reaches about 150 or 160 degrees of Fahrenheit. Less than 144 degrees are insufficient, and more than 167 are found to make the wool hard, crisp, and friable. The proper degree of heat is that, which begins to be too great for the hand to bear.

At this heat, a quarter or half of a fleece is thrown in, according to the size of the boiler. The less there is at once, the more

* I had the satisfaction however lately to learn, that the process I have given in the Domestic Encyclopædia, (article wool), translated from the *Leip-sic Magazine*, for washing wool, has been applied with success to the Merino fleece. The process differs in but few essential points from that of Gilbert.

perfect will be the scouring. Then for three or four minutes the wool ought to be moved, by continually lifting it up with a small fork of wood, so as to separate the proportions as much as possible. If it were turned, it would entangle, which would not only prevent it from being thoroughly cleaned, but render it less fit for the subsequent operations which it is to undergo.

The water being now at such a temperature that the hand can bear it, the wool is to be taken out either with the hands or with the fork, and is put into a basket, which is held for a moment over the boiler, in order to save the yolk-water. It is then carried to the water in which it is to be rinsed.

In proportion as the water in the boiler wastes, the loss is repaired by the gradual addition of fresh yolk-water, as every portion of wool is taken out; so that the heat may be kept up to the same uniform standard. When the yolk-water, by successive immersions of new wool, becomes thick and muddy, the boiler is emptied, and the bath is entirely renewed.

The water employed for the purpose of rinsing should be as soft as possible. A clear running stream is, on many accounts, best. The water of wells is the worst; but where no other can be obtained, it may be meliorated by exposure to the air for some days, or even by being previously boiled.

The wool is rinsed in large baskets of open wicker-work, in order that the water, in passing through them, may carry off all the extraneous substances which may have adhered to it. In running water, two such baskets, each of an oblong square form, are fixed near each other, at the bottom of the water, so that the sides of the basket shall be some inches above the surface, in order to prevent the water from carrying away the wool. The wool is washed in the basket which is farthest down the stream, the higher basket being meant to receive it after it has been so washed. Here it is fully purified from every thing which may have escaped the washing immediately preceding.

To the perfection of this last operation, nothing contributes so much as the manner of performing it. The wool must never be rubbed, which would twist, and even felt it. It is sufficient to move it briskly in the running water, and to open it as much as

possible with the two hands ; or, if the work be on a large scale, to move the wool constantly from one end of the basket to the other, by means of a rake. When it appears to open well, rises to the surface, and spreads itself there like a sort of cloud, and, at the same time, the water runs transparent out of the basket, the wool is then thrown into the upper basket, where it is allowed to remain for a few minutes, and is then taken out to dry.

When one is forced to wash in stagnant water, it is necessary to line the bottom in such a manner, that the water may not easily become muddy. In this case it is necessary to use a smaller basket, with two lateral handles, by means of which it may be plunged in and out of the water, till it comes out perfectly clean.

Instead of draining the wool, as it is taken out, on an inclined plane of stone, which is the first process of drying practised on a vast scale at the washing places in Spain, Gilbert recommends a method which, he says, he has found much more expeditious, and which is to squeeze out the water by means of a press. According to him the pressure is so far from being injurious to the wool, that it causes it to open the better. It is easy to see what benefit must arise from thus enabling a person to finish the whole operation of drying in one single fine day.* For this purpose, the wool, when taken from the press, must be spread on dry turf, previously cleaned by raking and brushing.

The wool thus washed, being only in the Spanish state, and still containing a portion of the yolk, which consists of fat incapable of being detached by the saponaceous part aided by hot water, farther means will be necessary in order to remove it. To effect this purpose the manufacturers employ urine. According to Vauquelin, fresh urine, which contains uric acid, and therefore decomposes the soap of the yolk, is, on that account, detrimental to this operation ; and stale urine, which derives its power merely from a small proportion of ammonia and mild potash, is inadequate to it. Nevertheless, it certainly succeeds in England, according to Dr. Parry, which the manufacturers explain by sup-

* I believe that this method is employed in many of the English manufactories.

posing the urine of beer drinkers is chemically different from that of those who drink weak and ascesent wines. Whether this be true, or whether the difference arise from superior skill in English workmen, he cannot determine. Some persons recommend, for the same purpose, a small quantity of pot-ash or soda; and Vauquelin advises soap, in the proportion of about one-twentieth of the weight of the wool.

CHAPTER VI.

FINE wool, not confined to Spain.—Merinos thrive in various parts of the world.—Climate, exercise, food, have no effect on quality of wool.—Notice of Merinos in the United States.

FOR a long time it was generally believed in Europe, that fine wool could be only raised in Spain. The first nation that proved the absurdity of the prejudice, was Sweden. In 1723, a flock of Merino sheep were introduced into that country, and such was their multiplication, that in 1764, there were 65,369 sheep of the pure breed. This rapid increase was in all probability owing to the bounties given by the government to all venders of fine and good wool. The Danes followed the example of the Swedes, then the elector of Saxony, Piedmont, Prussia, the German princes, and Holland. France was not behind hand, but it was not until the year 1776, that any systematic attention to the improvement of wools, took place. England, a great woollen manufacturing country, and alive to every thing connected with her aggrandisement, strangely overlooked this great source of individual and national wealth; her travellers returned home without noticing the existence of fine woolled sheep in the accounts of their tours, and even when the treasure was forced upon them in 1792, by the extraordinary generosity of the king of Spain, who sent to the king of England, several Merino sheep, no measures were taken to propagate the breed to the extent their necessities required, or the opportunity permitted. They continued to send away millions for fine wool to all parts of Europe, particularly Saxony, without once asking the question—cannot we raise this at home?

At length however, Dr. Parry, of Bath, made the experiment of crossing a Spanish ram, originally presented to the king, and which he obtained the use of, with Ryeland ewes, a hardy fine woolled breed of England. Lord Somerville, Mr. Tollet, and other spirited improvers followed in the train, and notwithstanding the violent opposition raised to their efforts by interested persons,* they soon proved that the opinion of the impossibility of growing wool in England equal to that of Spain was a vulgar error. Unprejudiced manufacturers after having made up broadcloths, cassimeres, flannels, and other stuffs from the Anglo-Merino wool, pronounced its quality in every respect equal to any imported: and so far from any degeneracy having taken place, where proper care was taken with respect to all the necessary points, that Doctor Parry declares his fourth cross with a Spanish ram, has given him such fine fleeces, that he injured the quality of the fleece of a whole generation by making a fifth cross with an imported ram. With respect to the quantity of the wool, it has been already stated, that it has increased in England.

To put the question of the EXCLUSIVE CAPACITY of Spain to grow superfine wool, to the unerring test of truth, Mr. Lasteyrie, of Paris, undertook the arduous task of making a sheep tour through the continent of Europe, to examine personally into the actual state of the fine woolled flocks. The result of his observations, which he has given in a concise work,† shew that the *fineness and weight of fleece are by no means relative to climate, soil, temperature of air, quantity or quality of food, size or habits of life*; and above all, MUCH EXERCISE is not essential to the production of fine wool. He left them in France, and saw them naturalized in Sweden, Denmark, Germany, Switzerland, Piedmont; to which may be added, the Cape of Good Hope and New-Holland. This immense tract affords a range of latitude from 59° 20' north, to 34° south, and includes countries, some of which

* Many of the manufacturers of woollen cloth in England are concerned in the importation of Spanish wool. They therefore were opposed to the plan of rendering the country independent of a foreign supply.

† Histoire de l'Introduction des Moutons à Laine fine d'Espagne, dans les divers E'tats de l'Europe, et au Cap de Bonne Espérance. Paris, 1802.

are elevated, others low, some dry, others swampy, some open, others woody, some rich, some poor, some hot, others temperate, others intensely cold. In one country, this breed is exposed during the whole year to the external air, and all the vicissitudes of weather, and exercises itself at will. In another, it is constantly housed during the night, and sheltered from every storm; or for six or seven months of winter never uses its limbs, or inhales the open air, except during a part of the middle of a very fine day. Even in Spain itself, so far from the constant change of climate, upon which so much is supposed to depend, being necessary for the preservation of the fine quality of wool, he found that many of the finest of the Merino breed *never* travel.*

The food of the Merinos is not less diversified than their climates and treatment. In some countries they feed on grass through the whole year. In others, hay is added in winter. In Spain they feed not only on the fine herbage of the mountains, but on the succulent grass of the richest meadows, and occasionally on the leaves of vines and other trees, and all the variety of plants in the fallow or stubble fields. In other countries they are variously fed on clover, saintfoin, burnett, chicory, lucerne, reeds, the leaves of different trees, and the haulm of plants, all either fresh or dry, straw, the fruit and husk of the horse chestnut, bran, potatoes, carrots, beets, peas, beans, grains of all kind, and every sort of turnip and cabbage. Thus, says Dr. Parry, under this diversity of climate, soil and treatment, than which the mind can scarcely picture a greater, the Merino race of sheep has been found by experience to thrive and produce wool, which is in every respect, fully equal to the very best of the native growth of Spain. These facts prove that it is PECULIARITY OF BREED which we are to consider as chiefly productive of fine wool, in spite of the operation of other causes, and that the Merino breed is capable of bearing its transcendent fleece in this or any other country, in which it can subsist in sound and robust health.

I believe the first publication containing an opinion of the necessity of changing the climate to preserve the quality of wool

* In Spain the travelling flocks are called "*Transhumantes*," the stationary flocks "*Estantes*."

is the letter of Don John Bowles to Peter Collinson, inserted in the *British Annual Register*, for 1764, and which gave the first account of the travelling flocks of Spain. This letter I had read several years before my attention was turned to the subject; and was even then struck with the apparent absurdity of the notion. I was pleased, therefore, to find it in the course of my reading some years after, completely refuted by so respectable an authority as Bourgoanne, who attributes the annual peregrinations to the true cause, viz. a search for food. Col. Humphreys, in a paper addressed to the Massachusetts Agric. Soc., stated the strong fact of the existence of stationary flocks, and of their fleeces being of equal fineness with the transhumantes, or wandering sheep. Both those authorities were quoted by me in 1803,* and I added the additional authority of Lasteyrie, whose report of his sheep tour through the continent of Europe, had been slightly noticed in the foreign journals, and who particularly mentioned the fine quality of the fleeces of those Merinos that do not travel. Notice of the same fact had been since so frequently made, that I thought no one could entertain a doubt of it, and yet only a few weeks since, a tedious letter was inserted in a Boston paper, on Merino sheep, and unfortunately generally republished, purporting to be lately written by a gentleman long resident in Spain, which upon examination I found to be Don Bowles' letter to Collinson, containing a repetition of the errors which Mr. Humphreys, in the same town, had fully refuted six years before! Zeal without judgment, or knowledge, is extensively mischievous. Had the editor been acquainted with the subject, he would have known that the whole of the history of the Merino travelling flocks, their management, discipline, and in short all the truths contained in Bowles' letter had been detailed last year, by Mr. Livingston in his book on sheep, who had very properly omitted all the notions which recent experience had proved to be erroneous.

ACCOUNT OF THE MERINOS IN THE UNITED STATES.

Until the present year, the only original imported stock rams and ewes, in the United States, were those of Mr. Dupont, Mr. De-

* Domestic Encyclopedia.

lessert, Col. Humphreys', and the Author's from Spain; Mr. Livingston's from France, and Mr. Müller's from Hesse Cassel. Of these, the two first mentioned arrived in 1801. Col. Humphreys' and Mr. Livingston's in 1802, the Author's in 1803; and Mr. Müller's in 1807. During the present year, several have been imported into the United States from Spain and Lisbon. The flock of Col. Humphreys' was the largest, he having imported upwards of one hundred sheep, from which and their descendants, many pieces of cloth have been made, and sold from seven to twelve dollars per yard. The particular history of Mr. Dupont's fine ram is as follows :

Don Pedro was imported into the United States, in the year 1801, and is believed to be the first full-blooded Merino ram introduced into North America.

Mr. Dupont de Nemours, then in France, had persuaded Mr. Delessert, a banker of Paris, to send to this country some of those valuable sheep, and he having been at the head of a commission appointed by the French government to select in Spain, 4000 Merino sheep out of the number of 6000, which, by the treaty of Basle, the Spanish government had stipulated to present to France; it is natural to suppose that those which he selected for his own flock, were among the best. Four fine young ram lambs were accordingly shipped, two were intended for Mr. Delessert's farm, called Rosendale, situated near Kingston, on the Hudson river; one was intended for Mr. Dupont de Nemours, who was at that time settled in the vicinity of New-York, and the other was to be presented to Mr. Thomas Jefferson. Mr. Dupont embarked in the ship Benjamin Franklin, on board of which ship the four lambs were shipped, and was unfortunately detained upwards of twenty days in England; his subsequent passage to the United States was long and boisterous, in consequence of which three of the sheep died, and it was with the greatest difficulty that Mr. Dupont preserved the fourth. The ship arrived at Philadelphia on the 16th of July, 1801.

In 1801, Pedro tupped nine Ewes at Mr. Dupont's place near New-York; he was then sent to Mr. Delessert's farm, and served

a large flock during the years 1802, 3, and 4. In the course of 1805, Mr. Delessert having determined to rent his farm, and to sell all his stock, the progeny of Pedro were sold at public sale, at reduced prices, to the neighbouring farmers, who had no idea of the treasure which was offered to them ; being unacquainted with that breed of sheep, they neglected those valuable animals, great numbers of which have perished in their hands, or were sold to butchers ; the rest would probably have shared the same fate, had not chancellor Livingston become acquainted with the existence of those sheep, and purchased at advanced prices some of the ewes, which he put to his fine Merino rams of the Rambouillet stock. Pedro, like the rest of the flock of the Rosendale farm, was sold at vendue, and Mr. Dupont's agent bought him for 60 dollars.

In July 1805, Pedro was removed to E. I. Dupont's farm, situated in the state of Delaware, near the borough of Wilmington. That gentleman had a very small flock at that time, but was anxious to see that valuable breed propagated in the country, and with a view to attain that end, he offered the farmers of his neighbourhood the use of his ram, gratis ; they could not be prevailed upon to think much of what was offered to them free of cost ; the consequence was, that very few ewes were sent to Pedro during three seasons, and only by way of experiment.

In 1808, however, Mr. Dupont, with a view of increasing his own flock, purchased from the farmers, his neighbours, as many half or three-quarter blooded ewes of Pedro's breed as he was able to collect, which measure raised his character among the farmers. Since that time Pedro has served every year, from 60 to 80 ewes ; the vicinity of Wilmington will therefore be supplied with a large stock of fine woolled sheep, and as Mr. Dupont & Co. are erecting works for the purpose, cloth of any fineness may be made.

Pedro is now ten years old ; but very strong and active ; he is stout, short, and woolly, and of much better form than Merinos commonly are ; and even better than that of a ram figured in a superb engraving lately received by the Agricultural Society of

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Philadelphia from Paris. His horns are large and spiral ; his legs short, and he weighs 138 pounds ; his fleece carefully washed in cold water, weighs 8 1-2 pounds, is extremely fine, the staple 1 3-4 inches long, and lying very thick and close upon his body ; it is entirely free from loose coarse hairs, called jarr. Every part of his fleece, moreover, is nearly of equal fineness, even the wool of the hind legs and thighs, which is long and coarse upon many Merino sheep, is short and fine upon Pedro. This point, which in the case of wool so valuable as that of Merino sheep, is of great consequence, will be transmitted to his progeny, and proves the value of stock derived from him.

HISTORY OF THE AUTHORS' FLOCK.

I had been early impressed with a sense of the importance of the Merino breed of sheep to this country, from a knowledge of the great superiority, in softness and durability of the Spanish and French cloths over the English ; and because I knew that the British manufacturers annually imported many thousand bags of fine wool from Spain, Saxony and other parts of Germany, for the purpose of mixing with the wool of England for cloths. I therefore gave two orders for a Spanish ram so early as the years 1796 and 7, one of these was not attended to, but a friend who, on my first disappointment was particularly charged with the commission, succeeded in bringing one as far as the Capes of Delaware, when he was washed overboard in a storm. In 1801, another order was given, through a mercantile friend, to P. Yznardi, the son of the American Consul at Cadiz, for a ram and ewe. In the month of Dec. 1803, two rams and two ewes arrived in the ship *Eliza*, Capt. Blissel, after a boisterous passage of 60 days from Cadiz. The ewes yeaned on the voyage in a storm ; and notwithstanding the humane and obliging attention of the captain, who took the suffering animals into his cabin, both lambs died. My disappointment may be judged of when I found the whole stock were *black* : and the circumstance of sending two rams and two ewes, instead of one white pair, could only be accounted

for upon the principle of a wish to increase the profit of the commission ;* for black sheep cost but little, being held in no estimation in Spain ; and hence the clothes of the shepherds and poor peasantry are made of their wool. I was gratified, however, to find, that although black, the wool of my sheep was very fine, their fleeces very close and thick : their heads and bodies covered with wool, and their form round and compact ; their horns were large and spiral, exactly similar to those on the Merino ram, figured in Anderson on sheep. Having at the time no land occupied in the vicinity of Philadelphia, I placed my sheep at the farm of Joseph Cooper, New-Jersey. In the spring, I was distressed to find that my sheep were affected with scabby eruptions, and that the flock of my friend was also partially infected. As no such disease had ever before been seen among Mr. Cooper's sheep, he naturally ascribed its appearance to contagion from the strangers, and was apprehensive lest a serious evil should in consequence be entailed upon his stock. The only bad effect, however, resulting from it, was the loss of wool occasioned by the frequent rubbing of the animal against the fences and trees which was caused by the irritation of the scab, and after some application, I had the satisfaction to find that the sores healed without difficulty. It is probable that the hardships which my sheep suffered on the voyage, together with the want of necessary attention to cleanliness on ship board, occasioned their scabbiness.

Having taken away my sheep, I determined to cleanse their skins completely, and therefore had them well washed with soap and water early in the spring, and a fine tooth comb passed carefully through their wool from head to tail. This operation was easily performed, the animals having been previously shorn, while in Jersey : a large quantity of dirt was combed out, after which they were turned out to grass.

My anxiety to propagate the breed would not permit me to lose any time in announcing to the country my intention to let the rams to ewes, and accordingly in August, 1804, I circulated hand-bills very generally to that effect. The price fixed for every ewe brought to the ram was *one* dollar. Not one was brought, and

* The price of the sheep was sixty dollars, the freight twenty.

such was the indifference exhibited, that not one farmer for two years had the curiosity even to examine the wool. This indifference was probably to be attributed to the total ignorance of the farmers of the nature and qualities of the sheep, and to that shyness with which they view novelties of all kinds. I thought the black colour might be an objection, but their equal indifference to a white ram of Col. Humphreys' stock, which I afterwards procured, convinced me, that the time was not yet come for the conviction of the value of the breed. Trusting, however, that the public mind would be awakened to the importance of the object, and satisfied that I was at least doing good to the country, I determined to proceed, and to infuse the wool of my Spaniards into as many fine American ewes as I could procure. In the month of the previous July, I had bought a flock of sheep, from which, by the help of a friend who had been employed to sort wool during several years for the Yorkshire manufactures, I selected fourteen fine woolled ewes, which I put with the Spanish rams, and sold all the rest without delay. One of my Spanish ewes was either taken from the farm, or strayed away in the autumn after they were put on my farm; the other ewe yeanned her first American lamb in November, 1804, another about the same time the next year, and a third in the month of June, 1806. Her example of rapid procreation was followed the next year by several of my half blooded ewes, the progeny of my Spanish rams: an occurrence altogether novel on the part of our native sheep, and attributable probably to the constant high keep of my flock. I have taken care to prevent a continuance of this practice, from a conviction of its injurious tendency.

In consequence of the hardships my sheep underwent during the voyage, their scabbiness, and the dirty state of the wool, an accurate opinion could not be formed at their first shearing, with respect to either the quality of the wool, or to the quantity yielded; but the second clipping enabled me to judge fully on these heads, and I was pleased to find that the fleece covered the whole of the body so closely as actually to refuse admittance to the fingers down to the skin. The quantity of the wool yielded by the rams was $4\frac{1}{2}$ and $4\frac{3}{4}$ lbs., and $3\frac{1}{4}$ and $3\frac{1}{2}$ lbs. by the ewes. The re-

moval of the fleece enabled me likewise to judge accurately of the carcase of the rams, which was very different from the defective form commonly seen in the Merinos; being round bodied and well proportioned, and without dewlaps. I was much pleased to find that notwithstanding my rams were black, yet that the lambs which were the produce of a cross with white ewes, were in many instances white. In some cases of twins, one was black and the other was white: in others, the wool was dark grey, or rather pepper and salt, samples of which have been shown to the Agricultural Society. I had the satisfaction to find the improvement in the wool very evident, and had the rams been but white, I should have wished none superior. The effect of the cross was apparent not only in the universal coating of their bodies, but likewise in the form of their progeny: the American ewes were long legged and narrow backed, but the very first cross gave them some resemblance to the compact figure of their sires, and which increased in proportion to the increase of blood. Their shapes are very much like those of the South Down sheep, as given in Scott's plates of Sussex prize cattle.

As I did not know the habits of my Spaniards, I thought it most proper to house the flock every night, in the winter, together with their companions; for this purpose an apartment in an old log barn was chosen, and abundance of clean litter constantly supplied. In this place, while they were sheltered from the weather, the free circulation of the air through it, prevented those diseases to which sheep are particularly liable from close confinement; they remained secure from the attack of dogs, which in my neighbourhood are very destructive to sheep, and furnished me with a choice parcel of the most excellent manure.

Some of the circumstances of treatment have been incidentally mentioned in the foregoing pages; a few more particulars shall be added. My knowledge of the economy and general nature of sheep were extremely limited at the time when my experiments began. On one point I thought I could not err, and that was, in securing my flock a due supply of food, winter and summer. In the latter season, this was better than they required as stock sheep, and when the extraordinary fatness of my Spaniards was seen by

my farming neighbours, the probability of their death was predicted. I afterwards learnt that it is a common occurrence for American sheep, when very fat, to lie down in the field without any previous apparent indisposition and die. But week after week passed over without the least sickness in my flock : during the winter, they had as much as they could eat at night, and when the ewes began to drop in the winter and spring, they were fed with the various articles of hay, wheat bran and water, turnips, and potatoes. My hay was of the best quality, clover, timothy, and natural green grass. In the spring, I perceived that the wool of my American ewes began to start, particularly about their neck and breast, while no appearance of shedding was observable in the Spaniards, although subjected precisely to the same treatment as the others. This peculiarity did not fail to strike me as very great in the case of the Merinos, and I accordingly mentioned it as an argument in proof of their worth, in addition to that of their fine wool. I had never seen it mentioned in print, for I had not then read a book on the subject, except Anderson and Somerville, both of whom omit to notice it. Neither Lasteyrie's work, nor Parry's papers in the Bath Memoirs had reached this country at the time. The subsequent year I had the satisfaction to find that the same quality was infused into the half-bloods. But the following spring I perceived that in some of the descendants, there were appearances of shedding, which I thought might be fairly attributed to the heat arising from my flock, (now considerably increased), being confined in one place at night. In the half bloods I still occasionally observed the disposition to shed fleece in the spring, but the three-quarter and seven-eighth bloods retain it well.

The ewes proved to be excellent nurses ; in but two instances in six years, have ewes refused to own their lambs. One was in the case of a first lamb, the other was in a black ewe that did not exhibit an appearance of bag sufficient to denote her approaching yeaning, and was therefore not penned : she lambed in the night, and having lost her lamb in the flock before she had licked it clean, probably did not recognize it. After the attempt of two days without effect, to induce her to own it, it was determined to

raise it by hand, and success appeared to attend the trial, when it was killed by an accident. This occurrence of an unexpected lambing might be prevented by noting the time in a stud or tup-book, when a ewe takes the ram; a fact which may be easily ascertained, if the ewe be white, by reddening the brisket and belly of the ram, and by the daily examination of the ewes, as formerly advised. They are keen feeders, and very forward in taking food, so that the Dishly ewes, from their modest diffident habits, would stand no chance with them if I had ever allowed a contest for the trough or rack.

Being well convinced of the plausibility of Dr. Anderson's opinion, viz. that there was no necessary connexion between fineness of fleece and bad meat, and being anxious to put to the test the *positive* assertion of Col. Humphreys, in his address to the Boston Agricultural Society, respecting the good quality of Merino mutton, I determined to have some of the half blood lambs killed; and I accordingly disposed of several of my black lambs to Mr. Raybold, in 1806, and having seen them in the stall, I was much gratified in finding them die well. Mr. Raybold declared to me, that he had not killed such fine lambs that season; many other persons saw them, all of whom acknowledged their excellence. Thus then I had the satisfaction to see, that if an amelioration in the quality of the wool should not prove an object of importance, the improvements in the flesh by the Merino cross, would be worth attention by the farmer; for extensive observation had convinced me of the truth of a speech of that experienced shepherd, the late Mr. Capner, that "the breed of American sheep was worn out."

But on the subject of the quality of the flesh of the Merino cross, it may be necessary to dwell more particularly. One of the arguments used by the importers of Spanish wool into England, against the propriety of attempting to improve the wool of Britain by the Merino cross, was the traditionary tale of the badness of their flesh; and the danger, if they were generally introduced, of their supplanting those breeds from which the markets had been before supplied with their great national dish, a *mutton chop*. This home argument, however, failed to produce

its effects, for Dr. Parry, Lord Sommerville, and others, immediately deprived it of all weight, by shewing that the mutton, under a tolerable chance of pasture, was excellent. In the United States, the same tale being often told, and the question as to the quality of the Merino mutton is often asked, it is thought proper to shew that the flesh is no way inferior when crossed with foreign breeds. Previously however to entering on the subject, it may be asserted, that even if the fact were as stated, it ought not to prevent the propagation of the breed, because, thanks be to Providence, there is a superabundance of animal food in the United States, and particularly of mutton; and the superiority of fleece of even a half or quarter blood Merino sheep, over that of a common American or other sheep, would render them an object worthy of speculation.

The opinion of the inferiority of the Merino flesh has probably originated from the known fact, that Spain, and particularly Madrid, is supplied with mutton from Barbary. If this argument is permitted to have any weight, it ought also by parity of reasoning to be concluded, that the cows, oxen and hogs of the vicinity of Madrid, afford bad flesh, because their beef and pork come from France; and that all the hens lay bad eggs because their eggs are brought from the Pyrenees.* The state of the case is, that Merinos in Spain are considered merely as wool bearing animals, and kept of course for their wool; the culled sheep only, being consumed by the shepherds of the travelling *cavannas* or flocks, and as those sheep have none but the common pasture, and are in almost perpetual motion except at night, their chance of acquiring fat is very small: but the case is very different when a fair chance is given the breed, of good pasture and proper treatment in other countries, as the following facts will show.

In England, nine wethers of the King's flock were sent in 1801, to the marshes, with the express view of trying the effect of rich pasture in fattening sheep of this breed: they were sold to Mr. Giblet, a well known butcher in New Bond-street; to whom, and to his customers, reference is made by sir Joseph Banks. He

* Lasteyrie, Traite, sur les Bêtes-a-Laine, p. 119.

adds, "experience, however, has demonstrated already, both at Windsor and at Weybridge, that Spanish mutton is of the best quality for a gentleman's table."* In a late communication to the Board of Agriculture of England, sir Joseph says, "the butchers readily offered for the sheep, when fat, a fair mutton price. There are two instances in which, when the fat stock agreed for was exhausted, the butcher who had bought them, anxiously inquired for more, because he said the mutton was so very much approved of by his best customers." Lastly, Dr. Parry† says, that "although, he has never less than from thirty to a hundred sheep or lambs feeding together, and is obliged to crop the grass of one field nearly bare, before he sends a division into another field, yet even under this management many of them have become fat, and have either been sold to the butcher at a price which was the very top of the market, or been killed for the use of his own family. Those which he has so expended, have been certainly superior in flavour to any mutton which he had ever purchased. The fat approaches in taste and consistency to that of venison, more than any of the native English breeds. The wethers have reached from 12 to 15 1-2 lbs. the quarter, and from a two shear sheep of the latter weight, he had 12 1-2 lbs. loose fat." He adds, "a butcher or grazier would doubtless have done much more for them in this respect, than was consistent with my views. Experiments of this kind, made by two gentlemen, whose names cannot be mentioned without insuring respect, have had the most satisfactory results: I allude to lord Somerville, and Mr. Tollet, the former of whose Merino Ryeland sheep, exhibited at the Bath Agricultural Society, were in all points greatly admired by various gentlemen, who saw and tasted them. According to Mr. Tollet, a half blood Merino Ryeland wether, weighed 18½ lbs. the quarter, and had 18½ lbs. rough fat; and it is worthy of particular notice, that while his best South Down wether weighed 22½ lbs. the quarter, and had 18 lbs. rough fat, another of the same age, half Merino, half Ryeland, fed with the former from

* Report of the state of his Majesty's flock, by Sir Joseph Banks.

† Comm. Board Agric. vol. 5. p. 470.

a lamb, weighed 27 lbs. the quarter, and had 23 lbs. rough fat.¹ Dr. Parry gives other statements to show the rapid increase of flesh and fat upon his Merino Ryeland cross selected without regard to form, but it is thought unnecessary to detail them. Those already given, are sufficient for all who view the subject dispassionately, but to others, who think that no animal can be good or profitable except it be large, the following fact, which a recent British publication enables me to state, will prove agreeable : Mr. Tollet produced at the Sussex Cattle Show, September, 1808, a three year old Merino wether, bred by himself, which weighed 33 lbs. per quarter, the fleece weighed 5 lbs. : and further, Mr. Wonner, a butcher of Philadelphia, informed me, that he killed a half blood lamb from the stock of Mr. Godly, of New-Jersey, four months old, which weighed 14 lbs. per quarter.

Besides the lot of lambs which I sold to Mr. Raybold, of the first cross, I have every year been in the practice of supplying my own table with lambs and wethers of different degrees of blood, from four and five months, to three years of age ; and was always gratified in showing them as favourable specimens of speedy and sufficient fattening. In particular, I may refer to twenty-one wethers, half and three-quarter blood, which I sold last October, to Jacob Shepard, of stall No. 76, New-Market ; a quarter of one of those (not particularly selected) was seen by George Clymer, Esq. Vice President of the Agricultural Society, and by a few of my neighbours, who, as well as the customers of Mr. Shepard, can speak as to the appearance and taste of the mutton. The fat was well diffused through the flesh without being deficient on the kidney.* The quarters weighed generally from 12 to 15 lbs., a size sufficiently large for a private table. Several butchers have killed half and quarter blood lambs in Philadelphia, from other stocks,

* The quantity of fat is much smaller upon the kidneys than what is seen in the large stall fed wethers which are shown every winter in our markets, and which attract the notice of the passenger. But I am not anxious to encourage such stock, being well convinced that no animal stall fed after grass, pays the farmer. Moreover, I conceive that after the flesh is properly marbled with fat, all superabundant fat is useless.

who if required would give testimony as to the excellence of the meat.

I have it in my power to state further on the subject, what other improvers will deem themselves happy in not being obliged to prove from their experience, viz. the flavour of the flesh of a full blood Merino.

Having had no demand for the progeny of my black rams, for breed, although carrying nearly as fine wool as I ever saw, I have been reluctantly induced to kill them. My last full blood ram lamb was killed in July 1809, for fear of his beginning to exercise his powers among my ewes. He was out of my own imported ewe, by Col. Humphreys' full blood white ram, now in the possession of William Pearson, Esq. of Bordenton, New-Jersey; and I can truly say, that better or more finely flavoured lamb I never eat. A friend, who like myself is fond of mutton and lamb, and who dined with me on part of this lamb, declared it reminded him of the small delicate mutton, whereof he had eaten in Wales.

I regret to have taken up so much time upon this question; but it has not been hitherto brought before the American public, and justice apparently required that the truth with respect to it should be known. I hope that good may therefore attend the discussion, by removing any obstacle to the extension of what I sincerely deem one of the most promising SOURCES OF GENERAL WEALTH THIS COUNTRY EVER POSSESSED.

In the year 1807, I was politely offered, by Mr. Bulkley, the use of a full blooded ram of Col. Humphreys; he was of a small size, but as to wool equal in quality to any, though in length of staple it was somewhat less than that of Mr. Livingston's rams. He was extremely gentle and strongly marked with the carnation hue of skin; had spiral horns and brownness of fleece surface,* all of

* This brownness penetrates to some depth from the surface, and arises from the retention of the particles of soil by the wool, which abounds with the yolk or natural grease exsuded from the skin, and diffused through the fleece. It might have been noted before, that by the analysis of this yolk by Messrs. Roard, and Vauquelin, it was found to be a true animal or natural soap, composed of potash, and a fatty matter. I very early remarked, that when handling Merino wool, the yolk adhered to the skin like oil, and when washed off, that it left the hands soft and smooth.

which qualities he faithfully transmitted to his progeny in their usual proportions. He sheared 4 lbs. full weight of wool washed on his back.

Upon the approach of the rutting season, all my rams except the one just mentioned, were put into the most remote field in the farm, and one given to leaping was hobbled; the tup ram was put with my ewes in the other extremity of the farm, and as I was much absent, my manager received a general strict charge to keep the flocks separate. I had no reason to doubt his veracity or attention, and therefore I remained at ease on the subject of deriving full benefit from the ram. The flocks were daily inspected, and regularly housed at night, nevertheless in the spring I was much mortified to find the greater part of my lambs covered with coarse hairs. As I had not noticed the occurrence in the case of the lambs from my own rams, and as the appearance was also novel to Mr. Du Pont, who was present on the 25th March, when the general examination took place, I could only conclude, that a long coarse woolled ram of a neighbour had visited my flock, and impregnated many of my ewes. My manager still persisted in the declaration of the care he had taken to prevent all intercourse with the ewes, except the selected tup ram, and although appearances were so much against him, I deferred forming my judgment until after the lapse of some time. I was relieved from much uneasiness in the course of a few months by seeing the hairy part fall off, leaving a fine coat, which gradually increased in thickness and quality. In the following season a neighbour brought two ewes to the same ram, whose progeny were also observed to be covered with hair, when first lambed.* It is extremely important to state, that this coarseness of Merino lamb's wool bears no proportion to the subsequent fine quality of the fleece of the mature sheep, and that some time elapses before an accurate judgment can be formed of the fineness to which it may arrive. Dr. Parry, whose authority is very great on every subject connected with

* I mention the above facts so minutely, for the satisfaction of those who are about to commence the breeding of Merino sheep; and to show the caution necessary in imputing neglect to those who have previously served us well, even where appearances would justify the suspicion.

Merino wool, and whose facts are the result of observations made with great precision and impartiality, says, that "our judgment as to the qualities of wool and carcase in this breed of sheep, cannot be accurately formed before they are two years and a half old, for which reason I do not like to employ or part with yearling rams, and much less my lambs. This same circumstance makes me much more averse to the castration of lambs, which I never perform except upon those, which have either sprung from coarse woolled ewes, or are grossly defective in point of carcase. The loss I thus sustain, bears no comparison with that of an excellent ram. Ignorant persons foolishly wonder, that for such a ram of the Merino race, Mr. Tollet refused two hundred guineas; but to a man solicitous for the establishment of a perfect flock, a ram pre-eminent in every point is absolutely inestimable, especially in a breed in which the choice is necessarily confined within such narrow limits. Actuated by similar views, I have at present rams, for which I would not take twice the sum offered to Mr. Tollet."

Ideas of fineness and softness are so generally connected with that of lamb's wool, that the want of those qualities in a ram may occasion an improper or unfortunate resolve with respect to one, whose subsequent superiority might prove highly beneficial to us: for this reason I thought proper to take particular notice of the circumstance, of the coarse appearance in some of my young lambs.

The following are the weights of some of my flock the present season.

Rams.	lbs.
Jumper, 4 years old, - - - -	134 $\frac{3}{4}$ shorn.
September, - - - - -	104 $\frac{3}{4}$
Don Pedro Jr., by Don Pedro, two tooth,	94 $\frac{3}{4}$ shorn.
Ram lamb, 3 months old, - - - -	47
" " 15 " " - - - -	35 shorn.
Ram, two tooth, - - - - -	74 "
" " " - - - - -	78 "
" 6 months old, - - - - -	74 $\frac{3}{4}$

No sheep can be more hardy than the Merinos. This hardihood may be a peculiar attribute of the race, or may proceed from

the nature of their fleece, which being so close and thick set, prevents the penetration of moisture, which is well known to be injurious to the constitution of sheep. In either case the consequence is highly important. Repeated proofs have been afforded to me of this fact, on the occurrence of a sudden storm of snow and sleet. Thus in November last, when from the mildness of the evening, the flock was permitted to be out, a snow storm unusually severe and cold came on, and in the morning when the sheep were brought home, and driven under shelter, I perceived that the Spaniards appeared insensible to the thick coat of snow and sleet crystalised upon their backs, while the open woolled New Leicester and American ewes, were evidently affected thereby, the moisture having generally penetrated to their skins.

In the autumn of 1808, I added sixteen half blood Dishley, or New Leicester ewes, to my flock, and crossed them with my new acquisition; the form of the progeny has certainly been thus improved. A shorter woolled breed would have been preferable, but all distinction of sheep in these parts of the country have been lost, and the forms of the drove sheep being so very inferior, I determined to take my chance as to the result of the cross on the working quality of the wool, and made sure of improving the form. The influence of the mother in determining the form, was indeed evident, not only in the improvement of those of my own flock, but as to the size, was strikingly illustrated in that of a neighbour's, who put two fine large ewes of the Irish breed to my ram; a ram lamb, the produce of one of those ewes, exhibited at the Cattle Show, last October, proved to be larger than my lamb, although Don Pedro, his sire, is larger than my stock tup:—the fact was, my ewe was smaller than the Irish descendant. No comparison of weights was made.

In imitation of the experiments made at the national sheep farm in France, of permitting the wool of some Merinos to grow for the period of three years, I permitted a yearling seven-eighths ram sheared in September 1808, to retain his fleece until the following July, as stated in the account of the Cattle Show, p. 53; there was not the smallest appearance of a disposition to shed his fleece, nor did he suffer in the least in his health or growth for

want of the usual proportion of covering after his fleece was taken off, three weeks subsequent to his exhibition at the Cattle Show. He was my tup ram of last year.

DISEASES OF SHEEP.

Agricultural works of Europe, and particularly of England, give an alarming account of the numerous diseases to which sheep are subject, but I have already mentioned that in this country they are very few and easily cured. The late Mr. Capner, of Flemington, New-Jersey, who had kept sheep in Leicestershire, has recorded the fact of the superior healthiness of sheep in this country when compared to England.* Some of my old ewes have died towards spring, apparently more from natural exhaustion than actual disease. One three tooth half blood Merino ewe died suddenly in April last. She was in a field, and was observed to lay down and gradually expire. My full blood ram lamb had the staggers when about fifteen months old, attended with a weakness in his hind legs. I bled him in the neck, and he got well. In the spring of the year they almost universally purge, a symptom aided greatly by the succulent wild garlic with which nearly all the arable fields on my farm, and in the vicinity abound more or less; but so far from any injurious effects being produced by it, that I think the plant alike salutary to them and to cattle. The swelling of the udders of ewes has been already mentioned.

I have often noticed the adhesion of the tail to the vent, owing to the glutinous nature of the excrements, but have had no difficulty in preventing loss, by simply washing the parts. In one case there was no vent hole, and had I been aware of the probability of such an occurrence, I would have tried the effect of perforating the part. In such case the aperture should be prevented from closing by gently inserting a twisted piece of greased linen.

For the scouring of lambs, Dr. Parry recommends a mixture of salt and refined chalk, dried over a fire, and to allow but little water. This remedy, with boiled milk, and occasionally corn meal

* Memoirs Agric. Soc. Philad. vol. 1.

in fine powder browned in a pan over the fire, cannot fail of being useful. Corn and boiled potatoes, as being nourishing and very strengthening, should be given in moderation to the ewes. A warm and dry shelter is indispensable.

A few sheep have had a soreness in the claws of their hoofs, which was easily removed by scraping the parts, and applying spirits of turpentine, or tar. A few have had some scabby eruptions on their bodies, in the spring before shearing, but I have never had occasion to apply any remedy. Unless when taken by infection, the true scab generally proceeds from poverty and want of attention to cleanliness. The remedies in the latter cases are obvious. In common cases the application of a little mercurial ointment, tobacco water or spirits of turpentine to the scab, will effect a cure. The rising of the wool will point out the part affected.

The staggers, or dizziness, which attacked three of Mr. Livingston's yearlings were cured in the course of six weeks, by good nursing, and supplying food whenever the animals would eat. "This disease is found upon dissection to be owing to a bag of water within the skull pressing on the brain. It is generally considered as incurable, though it is said by others, that it may be remedied by trepanning: a soft place on the head indicates the situation of the bag, which if taken out will remove the disorder."* This operation it is clear can only be performed by a medical man, and common sheep would not pay the expense. Lasteyrie says, that in Prussia, they secure their flocks from this disease, by fastening a linen cloth covered with pitch on the heads of the lambs, previously to conducting them into the fields. This cap, they maintain, prevents the intromission of the worm which the flies deposit in the frontal sinus, during the earliest youth of the animals.† A fact so important as this deserves to be attended to, and it is to be hoped, that in case the disease should become common, the experiment will be made.

Hoven.—In all brute animals, this disease proceeds from the same cause, viz. the sudden extrication of air from clover, or other juicy food too greedily devoured, causing a considerable swelling and painful distension of the body. The symptoms in

* Livingston on sheep, p. 107, Comm. Board Agric. Lond. vol. 1.

† Traite, &c. p. 192.

oxen and cows are so accurately detailed by Mr. Peters,* that it is unnecessary to dwell upon it here : it will be sufficient to state, that the remedy, the only certain and speedy remedy for the disease is to plunge the first knife that may be at hand, into the paunch, and to keep the wound open until the swelling subsides, by a tube of elder or of bone. Castor oil and molasses, or Glauber salts dissolved in water, or aloes powdered and made up into pills with soap, may be given to open the bowels.

The Rot.—In England it is universally allowed to proceed from moist exhalations in low swampy places, even confinement for a single night in such places has produced the disease : and yet it is acknowledged that it prevails on the dry limed land in Derbyshire. On the contrary, a swampy place near Wilmington, Del. was pointed out to me, in which a farmer kept a flock of sheep constantly without loss. Nevertheless, when it has appeared, the principle remedies that have been applied, are, removal to dry well-sheltered spots or yards, and a regular allowance of sweet dry food (giving but little water) with salt, or salt pasture. Also, “Tar rubbed on their troughs, free use of pitch pine buds and branches, sulphur in the early stages, camphor rubbed on their gums, or given in the form of pills.”†

It has been remarked, that sheep are much disposed to feed, during the three or four first weeks after being tainted. When the first stage is over, flukes begin to appear in the gall-bladder, and ducts, and before death are very numerous. In a few weeks after being seized, the sheep shrink, and become flaccid in the loins. By pressure about the hips, a crackling is sometimes perceptible, the countenance then looks pale, and upon parting the fleece, the skin is seen of a pale red, and the wool easily separates from the pelt. As the disorder advances the skin becomes dappled with yellow or black spots. Debility and emaciation succeed, and increase until the sheep dies.

The catarrhal affection, or running at the nose, has been supposed to be either a companion or-consequence of the rot in

* Memoirs of the Agric. Soc. Philad. vol. 1.

† On sheep in the United States, Comm. Board. Agric. vol. 1.

sheep. I have observed this complaint most commonly to affect old sheep, but have never lost one by it. I usually have rubbed tar on the nose, under the supposition that it proceeded from the irritation of worms breeding up the nose, as mentioned by Mr. Capner. Those whose sheep die after having this complaint should make it a point to open the head and bodies of the animals, in order to determine the question, and I will thankfully receive any facts on the subject. One general rule in this and all other complaints of sheep ought to be, to separate the sick from the well, for most of their complaints are contagious.

Ticks.—These disgusting insects are well known to be very troublesome and highly injurious to sheep. The common remedy in England is to soak the wool in arsenic water, but so dangerous a remedy ought never to be used, especially when tobacco water will answer the end effectually. Mr. Livingston recommends the following method, which is well worth being tried. "Take a bellows, to the nozzle of which a pipe must be affixed, capable of containing a handful of tobacco: set fire to the tobacco, and while one man holds the sheep between his knees, let another open the wool, while a third blows the smoke into the fleece: close the wool on the smoke, and open another place a few inches from it, and so go over the whole sheep, blowing also under the belly and between the legs: in twenty-four hours every tick will be killed. The whole operation may be performed upon a sheep in about two minutes."

Mr. Capner* mentions three kinds of intestinal worms, only one of which proved injurious; also worms in the frontal sinus proceeding from the eggs of a bee laid a little way up the nose, which creep up as they grow. Their existence is known by the sheep snuffling and throwing up its head. Tarring the nose is a palliative.

Of the terrible *fly*, the dread of the European shepherd, and the scourge of his flocks, we happily remain ignorant. It deposits its eggs on the wool near any wound or scratch, or even in one made by its own bite, and which, soon becoming maggots, eat and destroy all around them, and in a very short time kill

* Memoirs, Agric. Soc. Philad. vol. 1.

the animal. All wounds therefore from shears, briars or other causes should be rubbed with tar, or sturgeon's oil, or oil of turpentine, all of which are offensive to flies and insects generally.

What then it may be fairly asked, are the conclusions to be drawn from the facts already ascertained with respect to sheep, or the proper answer to the question of the success of the American shepherd? We have seen in the first place, that even with very deficient attention, there is a general prevalence of health in the American flocks, which of course could proceed only from the combined causes of climate and soil; and that by attention to selection, improvement in form, and in quality and quantity of fleece has been made, of which, any European improver might well boast. It has been further seen, that in the case of the invaluable Merino, the quality of the fleece of the imported stock has not diminished, and that the descendants of full-bred sheep yeanned in this country, have yielded at a first shearing, more wool than the male parent: that the live weights of the animals are fully equal, and in many instances superior to those of sheep of equal ages in Europe; and lastly, that their hardihood and health are greater than the common breeds of this country, and their flesh excellent.

There can be no doubt therefore, that the perfect freedom and unrestrained manner with which all our agricultural operations are conducted, and the great encouragement given to the growth of fine wool by the demand for fine cloths; that the extension of the Merino breed promises a greater and quicker return for capital employed, than any other object which can engage the farmer's attention. As to the fear of their too great increase, let any one reflect upon the immense sums of money annually sent to England for broadcloths, and then answer the question, whether there is reasonable ground to expect the business to be over-done at least for a long time. It is only for want of wool, that our stores are not now all furnished with fine cloths. In every part of the country where there is a supply of the raw material, machines for carding and spinning it have been erected.* The time

* See Mr. Livingston's letter to the Editor. p. 17.

will shortly come, when the prediction which I made in 1803, as to the probability of wool becoming an article of export from the United States, will be verified. On ourselves does the fulfilment of it depend: nature, climate, and soil, will do much for us.

I regret that I was unable to insert in the proper place, the following additional accounts of improvements in carcase and fleece of sheep in Virginia: they are now given as honorable testimonials of successful zeal and enterprize, and to give encouragement to those disposed to undertake the task of improving. The sheep were exhibited at Mr. Custis's show, in April 1808.

Mr. Lawrence Lewis, of Wood Lawn, Virginia, exhibited a lamb called Dishly, of the race of Arlington long woolled breed of Mr. Custis. He weighed on the hoof, 140 lbs.—fleece, 6½ lbs.

Mr. Hazard Foster's lamb "Badger,"* same breed and age, weighed unshorn, 105 lbs., the staple of the fleece measured 12 inches.

"Superb,"* a yearling, was bred by Col. J. Tayloe, from a ewe of Mr. Dorsey's stock, by a ram of Mr. Tayloe's own breed—his fleece weighed 8½ lbs.

Mr. William Alexander, of Preston, Virginia, showed a lamb called "Preston," weight unshorn, 146 lbs., fleece 7½ lbs.

The judges of the day were

THOMAS DIGGS,
J. MASON,
WM. LEE,
JONA. SWIFT.

* See p. 71.

ERRATA.—Page 88, line 13, for *as far back as the tail*, read *the back as far as the tail*. In some copies, for *affects*, read *effects*. Page 109, line 2, in some copies, for *carcase of the rams, which was*, read *carcases of the rams, which were*.

ARCHIVES

OF

USEFUL KNOWLEDGE.

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OCTOBER, 1810.

No. 2.

BANK OF INDUSTRY.

ONE of the first duties of a great city, is to apply the remedies that may be in its power, to the evils necessarily arising from its own extensive population. It is incident to any such mass of population, to concentrate within itself, not only the idle and the vicious from all the country, but a great class of improvident people, who are honest and willing to earn their living, but who do not readily see the means of saving what they earn. This class of people often fall into distress for want of some easy and familiar method of placing their surplus earnings, at one season, in such a situation as to be safe and always within their reach in times of need. What is not immediately necessary to their comfort, they squander in useless and perhaps vicious gratifications, creating factitious wants, and inducing habits of idleness, which lead to misery, then to crimes, and finally to punishment; augmenting the poor-rates, rendering property insecure, and thus multiplying the evils, and diminishing the benefits of a dense population.

Let us suppose a case to which I make a direct reference. A servant receives 20 dollars for wages due. He is well disposed, and if he knew of any mode of placing it where it would be safe and productive, he would not only lay up the greater part of this sum, but he would be adding to it every month, till with its interest it would amount to a considerable sum, and enable him to

rear and educate a family. But for want of such facility, he will not probably have a dollar left at the end of the month. Some new article of dress or ornament, the theatre, or a worse gulph has absorbed all. The case here referred to, is but one instance out of thousands in this city, among journeymen, labourers, men-servants and women-servants : useful classes of people, who compose a considerable portion of the population of every great town, all of whom receive more wages than are necessary to their real or customary wants.*

These evils, like many others usually neglected, are not without an obvious remedy. Let the Treasurer of the Corporation be the banker, and let there be a clerk allowed him to attend to the particular duty of the Chest of Savings. Let him receive and book every sum that is offered, not less than one sixteenth of a dollar ; and give a bank-book, to be made at the expense of the Corporation, to every person who shall have deposited to the amount of ten dollars, in which may be entered by the clerk each sum deposited or drawn out. Every credit of five dollars and upwards should entitle the creditor to an interest, at the rate of five per cent. per annum, for any period over sixty days. Credits in the CHEST OF SAVINGS may be transferred at the office with the same formalities as bank shares, but no sum less than fifty dollars should be transferable except by death. A creditor might be permitted to demand and receive, at all times within office hours, any part, or the whole of the sum due him, without any other formalities except that of presenting his book, and having it entered therein by the clerk, provided that no smaller sum than *one dollar* be drawn out at a time, unless a smaller sum be the whole balance due.

The public advantages that must arise from the plan are extremely obvious : as, 1. There is no surer shield that can be devised to the morals of the labouring and poorer class of people. 2. It would save them in a great measure from tippling, gamb-

* The wages of servants are from 8 to 16 dollars per month. Coachmen (a numerous class) have the latter sum, and many of them 20, and more, dollars, per month ; but in the latter case they board themselves.

ling, and other modes of dissipation and idleness. 3. It would probably save to this city 50,000 dollars a year in poor-rates. 4. It would serve as an example to other cities, and possibly it might lead to other reforms in public discipline, education, and police, on which few persons have reflected, but which are still wanting in the progress of civilization.

I do not pretend to the entire originality of this plan, and probably it may tend to enforce the propriety of adopting it, to inform that such a bank was instituted by the famous Mirabeau, and established by law in Paris, in the commencement of the French Revolution; the movers of which, amid all their projects of ambition and political aggrandizement, have never lost sight of every measure that could in the least tend to add to the resources of the nation, to give employment to the people, or diminish the unavoidable evils of their military government. The bank is called in English, the "*Bank of Savings*," and is at this day in full operation, and I have understood has been productive of the greatest advantages. It is also similar in its operation and effect to "*Benefit Societies*,"* which are very general in England, where they have been found to diminish the enormous poor taxes, under which that country groans, more than any legal or general regulation which has yet been attempted; and are spoken of in the warmest terms of commendation, by the well-informed writers on political economy who have appeared since their institution. If necessary, numerous authorities might be referred to in proof.

The above are merely the general outlines of the plan: much more might be said on the advantages which would result from its general adoption in every great capital: the minor details of its arrangement would be suggested to every intelligent officer acquainted with accounts, and are therefore deemed unessential in this place.

* These Benefit Societies are associations of the labouring people, or all orders of mechanics, who appropriate some small part of their earnings to a fund from which they may draw succour in the hour of need. The mechanics of several branches in Philadelphia have such associations, and I have understood from some of the members, that very great advantages have been derived from them.

ON THE

MANUFACTURE OF SAIL-CLOTH.

THE manufacture of canvas is an object of the greatest importance to a commercial nation ; its *quality* ought to be the first, its *price* only of secondary consideration.

It may appear strange, but it is true, that this article of indispensable necessity to the British navy, on which depends in so great a degree, the safety of the fleet and the empire, is now vastly inferior in *quality*, to what it was thirty or forty years ago.

While in their dock-yards, the greatest attention is bestowed on the quality and seasoning of the oak, none at all is thought necessary to the canvas, although of equal importance to the safety of the ship, and the lives of the sailors.

The very rules and regulations issued by the navy board for the manufacture of government canvas are defective ; and it is impossible, according to those rules, to produce a good quality ; however, it does not seem to be the aim of the board to obtain the *first* fabric, they are content with a humble mediocrity, that the owner of a fishing smack would despise.

The inferiority of government canvas cannot be attributed to the manufacturers, for they make it according to their *instructions* ; but to the mistaken policy of the navy board, who limit the price, and of course the quality—who imagine that canvas of a *certain* rate is sufficient for the purpose, and have no wish that it should be of a better quality, because then, it would be *too good for the use*. Thus, trifling with the great interests of the nation, as though his majesty's ships and the lives of his brave seamen, were of less importance than a revenue cutter or a Bridport smack ; neither of which would use such canvas as government receives, although it were afforded to them for nothing.

The professed reason for ordering this middle sort of canvas is, that it can be obtained at a *middle* price ; it is neither the high-

est nor the lowest that the country produces, but it is thought good enough for a man of war. It is, however, a common observation, and perhaps a true one, that the highest priced manufactured commodities are generally the cheapest in the end. Being made of better materials and more labour bestowed on their finishing, they compensate the purchaser by long service, as well as their superior fitness for the purpose intended.

Government canvas is made of a warp or chain of flax yarn, weighing about 20 lbs. laid double, the woof or shute is of hemp yarn drove on single, weighing about 24 lbs. Both warp and woof yarn are once boiled in an alkaline ley, and suffer a waste of about 7 per cent., which is again recovered by the application of starch to the chain, and the bolt when finished, for a No. 1, weighs 44 lbs.

Bridport canvas, which is the best in the kingdom, is made wholly of flax yarn, boiled in alkaline salts and bleached by grasing, by which operations it suffers a loss of about 25 per cent.

To ascertain the difference of value to the consumer, between these two kinds of canvas, it is only necessary to observe, that the great defect of all canvas, is its aptitude to *mildew*, from its alternate exposure to warm and cold, dry and wet weather. Mildew, is the first perceptible symptom of fermentation to which all vegetable substances are liable, and its progress will be rapid or slow, in proportion to the quantity of *mucus* they contain. The fermentation of all vegetable and animal substances induces new compounds, and consequently separates their component parts; hence their gradual decay, and at last, their final dissolution.

On this principle we may determine the superiority of Bridport canvas. It is cleansed by alkaline salts, and the process of bleaching to a loss of 25 per cent., and we may reasonably conclude that the mucus is altogether removed, or nearly so. It will not therefore be so apt to mildew as government canvas, which is only cleansed to a loss of 7 per cent.

The difference of price between Bridport and government sail-cloth is 6*d.* or 8*d.* per yard; and what does this paltry saving signify to a great nation, compared with the consequences that may

result from the use of an article on which so much depends, as the lives of brave men?

The following remarks on this interesting subject by the Earl of Dundonald, are well worth the attention of the Manufacturer. The name of this nobleman stands high among the improvers of the manufactures of his country, and Britain owes much to his inventive genius, and to his application of the principles of science to the useful arts.

REPORT on the Method of Manufacturing, and the Properties of Dutch, Danish, Bridport, and British Navy Sail-Cloth. By the EARL OF DUNDONALD.

LORD DUNDONALD duly received the samples of Dutch and Danish canvas, which Captain Johnson Hope had sent for his inspection. He has minutely examined and analyzed them, and subjoins his report as to their fabric and degrees of cleansing, which the yarn, of which they had been manufactured, had been made to undergo previously to the operation of weaving. Likewise his report of four bolts of canvas, viz. Nos. 1, 2, 3, and 4, made according to his directions, by Messrs. Fowler & Son, of Bridport, samples of which accompany this. Messrs. Fowler's would have been preferable in quality to any Holland duck, had it been made of hemp instead of flax, and wove with two and a half or three more scores in the reed. Messrs. Fowler not having any thoroughly well boiled, grassed, and bleached hemp yarn at the time the order was given, were under the necessity of substituting the flax yarn employed by them in the manufacture of canvas, likewise employed by all the manufacturers of sail-cloth at Bridport, Crewkerne, and in the south-west of England; from which places all the revenue vessels, packet boats, and smacks of Great-Britain and Ireland, are exclusively supplied with canvas for their sails. The Bridport and Crewkerne canvas does not mildew, and does considerably more than outlast two suits of sails made of such canvas as the British navy is at present, and has for upwards of thirty years been supplied with. The Bridport, &c. &c. canvas stands its number to the last, without any loss in weight further than shall happen from friction; because the yarn

of which the Bridport had been wove, had been repeatedly and thoroughly boiled with alkaline salts, grassed, bleached during some weeks, and fully divested of all soluble extractive matter, capable of being washed out by the rains. Besides which, Bridport, &c. canvas, is wove with little or no wheaten flour dressing, which is likewise soluble, and removed at last by the conjunct action of rain and weather.

While these two soluble substances remain in the canvas, it will to a certainty mildew in damp hot weather. But say that the canvas had not mildewed (the weather being supposed cold and rainy); the rain will wash out the two soluble extractive matters, whereby the canvas becomes open between the threads, like a biscuit bag, incapable of holding or containing the wind. Lord Dundonald has proved this to be the case on fifty or sixty trials made with navy canvas. No 1, the canvas proper for ships lower sails, has uniformly been reduced by two boilings to the weight of a No. 4, the number proper for a topgallant sail; sometimes to the weight of a No. 5, which corresponds to a loss in weight of 20 per cent.

It is obvious that the soluble extractive matter of the flax or hemp, and the weaten flour paste dressing, cannot add to the strength of the yarn, of which the canvas had been wove.

The soluble matter only serves for a time to fill up the space between the threads. To mislead the eye as to the quality of the canvas, and to add to its weight, so as to make it correspond to the regulations of the Navy Board, which requires that canvas

	<i>lbs.</i>
No. 1, should weigh per bolt, - - - - -	44
— 2, - - - - -	41
— 3, - - - - -	38
— 4, - - - - -	35

Lord Dundonald has already stated, that navy canvas, No. 1, had been reduced by him by two boilings with a solution of alkaline salts to the weight of a No. 4, which corresponded to a loss in weight of a fifth, or 20 per cent.; and with such canvas the British navy is at present, and has for these thirty years been supplied. It is impossible to conceive why the British navy is supplied

with a sort of canvas which is uniformly rejected by the revenue cruisers; as if it was an object of less importance to capture an enemy than to catch a smuggler; or, as if the safety of the revenue vessels and their crews were of more importance than the safety of the British navy, and the lives of the gallant seamen, who man their fleets and fight the battles of their country. The highest degree of blame is to be attached to the conduct of the Navy Boards during these thirty years past, and to whom, unfortunately for the navy, the sole power of regulating the method of manufacture, as well as the price, has been entrusted. The price for these thirty years past has been so low, that it was impossible a manufacturer could, without a certain loss, employ the best materials, and thoroughly cleanse the yarn. He could not even afford to cleanse the yarn to greater loss than 5 per cent. instead of 20 or 25 per cent., as is the practice in Holland and Bridport: and even this small loss of 5 per cent. was more than amply made up by the copious use of wheaten flour paste or dressing, employed to glue or stick together in a flat or horizontal direction the double threads of the chain or warp, of which the navy canvas must be made, according to the regulations of the Navy Boards; being a system of manufacture in direct opposition to that of Dutch canvas, which is wove with single thread and little or no dressing; no more paste at any rate being employed than to protect the threads of the chain in weaving from the friction of the reed, and the mails of the harness. But double-thread canvas cannot be wove without a great deal of dressing, absolutely necessary to glue or stick together the two threads in a flat direction.

The double threads of the chain thus arranged may be likened to a flat tape, and which improperly fills up the reed, giving but a superficial and thin covering to the woof of the canvas; as it is the chain or warp, and not the shoot or woof, which comes to the surface, suffers the friction from wear, and supports the whole weight of the sail, whether dry or wet, when bent to the yards. The chain therefore should be strong, spun of the best materials, thoroughly well cleansed; and with two and a half or three more score in the reed, than is required by the Navy Board's regulations. No. 1, is directed to be wove with a $16\frac{1}{2}$ score reed, where-

as there should be at least eighteen and a half or nineteen score. This will fill the chain fully up, and produce a strong close canvas. If the yarn is thoroughly well boiled with alkaline salts, grassed, and bleached, the canvas will never mildew, and will stand its number to the last, will continue close, and will hold or contain the wind, full as well as when the sail was first bent. The present price paid for navy canvas is by much too low, it is only 20*d.* per yard; while the price paid for canvas for the revenue cruisers is from 24*d.* to 28*d.* or 30*d.* according to its width, degree of cleansing, and other circumstances. Former Navy Boards have proceeded on a supposed system of economy, but it has proved, for these thirty years past, a most ruinous one for the British navy. Many a ship and life have been lost, and many an enemy's ship has escaped, from the bad quality and inferior strength of British navy canvas. If the Lords of the Admiralty will cause the proper inquiries to be made at the Board of Customs and Excise, it will appear, that from the superior last of Bridport and Crewkerne canvas, the revenue cruisers are, in proportion to their tonnage, supplied with sails at a much cheaper rate than the navy, besides being exempt from the accidents already mentioned. There is another circumstance in which navy canvas is deficient, namely, that the rope twine, with which the Navy Board is supplied, is at too low a price, and is therefore made of damaged or inferior materials. It is so very bad, that the sails sent on board the King's ships, have frequently to be sewed afresh to the bolt rope, and this always must be done after the sail has been worn some little time, and the dressings and starch washed out. If this is not done, the sail will bag, and cannot be properly braced up on a wind; whereas Dutch and Bridport canvas will stand true, like a board, to the last. Sails are to ships, what wings are to birds—damage or cut their wings, they can no longer fly.

Why is the whole attention of the Naval Board, and the Naval Officers at the different yards, directed to the state and repairs of the hull? A hull is a log on the water, without sails to direct her course; and if these sails are of a bad quality, and sewed to the bolt ropes with bad rope twine, they will give way on a strong press of sail, either in chace of, or when flying from an enemy of

superior force ; and the ship fitted out with them will never be able to claw off a dangerous lee shore.

The present system of manufacturing canvas for the navy, is in every part of the manufacture in direct opposition to the Dutch method ; as if the difference of latitude and longitude between Helvoetsluice and Harwich, only 120 miles distant, require methods of manufacture diametrically opposite. Dutch canvas has always been admitted to be the best and most durable canvas manufactured in Europe, while the British navy canvas has been experienced to be the worst. Why, therefore, did not former Navy Boards adopt the Dutch method? The late and former commissioners will find it difficult to account for their conduct : they disregarded every representation on the subject made to them by the writer of this, as well as by some of the best informed and most respectable manufacturers of canvas in England ; copies of whose letters are to be found at the Navy Board, if not committed to the flames. But Lord Dundonald has copies of many of those letters, which he can produce ; and several letters on the subject are in the possession of the Board of Naval Revision, and which, in the strongest manner, corroborate his opinion as to the most judicious manner of manufacturing sail-cloth.

Lord D. is not a theoretical, but is a practical canvas weaver: he had, about five years ago, looms at work ; the canvas not for sale or profit, as he never sold any ; done to make himself fully acquainted with the weaving branch, as well as the best methods of cleansing the yarn. These experiments of his, cost upwards of five hundred pounds in looms, utensils, rent, materials, and workmen's wages.

Lord D. undertakes to prove every thing stated in this, and in the accompanying papers, to the satisfaction of the present Lords of the Admiralty. He requests to be permitted, and to have an order to go to Deptford Yard, to cut two yards of canvas from twenty or thirty bolts taken promiscuously, and without selection ; he engages to prove, that it will lose by two boilings with alkaline salts, from seventeen to twenty per cent. of its original weight. Every sample to be marked, or ticketed with lead, in a manner that shall correspond to the number of the canvas,

and the maker's name. Lord Dundonald requests that his permission to take samples may extend to the hammock stuff, which is at present in every respect deficient and inferior to the hammock stuff when Lord D. was in the navy. In his present and former exertions to improve the manufacture of sail-cloth, he has not, nor has he ever had, the most distant idea of emolument to himself; he loves his country, and is, from many considerations, strongly interested in the success and welfare of a profession to which he once had the honour to belong; having in the year 1770, been Admiral (then Captain) Paisley's lieutenant in the Weazle sloop of war, on the coast of Guinea station.

The present situation of Britain, as respects the countries from whence she was formerly supplied with naval stores, particularly hemp and flax, requires that those articles should be husbanded with the greatest prudence and economy; and should be made in a sound state, to last as long as possible. Lord Dundonald is informed, that the navy has, at present, three years stock of those articles in store. If even but one year can be added to the last of those articles, it is a great object, and will give full time for bringing forward the necessary supplies from Canada, the East Indies, &c. or for the cultivation of hemp and flax in the fens, and reclaimed bogs of Great-Britain and Ireland, for which they are well adapted. This will not take any part of the land from tillage or pasture: a bounty should be given on the sound and dressed hemp thus raised; likewise a premium for saving the seed of hemp which had been sown for the express purpose, but no premium on the hemp itself, as, from the ripening of the seed, it is of an inferior quality, and only fit for coarser purposes. Britain will likewise suffer as to the supply of iron she formerly got from Russia and Sweden; but that will be but for a time: the manufacture of coak-made iron is rapidly advancing in Britain, and should be encouraged by the legislature instead of being saddled with a duty, as was proposed to be done by the two late Chancellors of the Exchequer.

The war with Russia will promote in Britain the manufacture of the coarser fabrics of linen and hempen cloth, formerly had from Russia and Silesia. The cotton manufacture may, for a

time, decline, but the linen manufacture will proportionably advance. Without British capital, Russia may shut up shop. Her hemp, flax, iron, tallow, pot and pearl ashes, and linens, will remain on hand; manufactures and trade will be at a complete stand; and Alexander may, ere long, meet with the fate of his father and grandfather.

Methods of Manufacturing Dutch and British Navy Canvas.

DUTCH CANVAS.

Chain or Warp, single, of Italian hemp.

Shoot or Woof, of the tow of ditto, ditto.

The yarn-cleansed to a loss of 20 per cent.

Little or no dressing employed.

Chain contains at least three-score more yarns than British navy canvas.

The shoot well driven up; canvas close, and, as it were felted.

Stands its shape, number, and weight to the last, when made into a sail.

Does not mildew.

BRITISH NAVY CANVAS.

Chain or Warp, double, of flax.

Shoot or Woof, of the longs of hemp.

Yarn cleansed to a loss of from 3 to 7 per cent.

A very great proportion of wheaten flour dressing employed, to glue or stick together the double threads.

Chain not near so close and strong as Dutch canvas.

The shoot being of the longs cannot be driven so close up.

Does not stand its shape, number, and weight; when made into a sail, loses from a fifth to a sixth of its weight.

Is liable to mildew.

Report on Dutch, Danish, and Bridport Sail-Cloth.

HOLLAND DUCK, OR DUTCH CANVAS.

Breadth, 30 inches.

Chain single, of Italian hemp.

Thirty single threads in the inch of chain.
 The shoots, of the shorts, or tow of ditto.
 The shoot well driven up, and canvas close.
 Wove with little or no dressing.
 Cleansed in the yarn, to a loss of 20 per cent.
 Will not mildew.

DANISH CANVAS, HEAVY NUMBER.

Breadth, 31 inches.
 Chain double, of hemp.
 Eighteen double threads in the inch of chain.
 The shoot, of the longs of flax.
 Canvas well manufactured.
 Wove with less dressing than the British navy canvas.
 The canvas apparently callendered.
 Cleansed to a loss of 17 per cent.
 Will not mildew.
 Is in every respect preferable to British navy canvas.

LIGHT NUMBERS OF DANISH CANVAS.

Breadth, 29 inches.
 The one apparently a No. 4 or 5, the other a No. 8.
 Both chain and shoot of flax.
 The yarn well spun, and canvas well wove.
 The yarn not cleansed at all.
 Loss on boiling No. 5 with alkaline salts, 20 per cent.
 Ditto ditto No. 8 ditto 17 per cent.
 Liable to mildew.

*Samples of Canvas of the Manufacture of Bridport, made by
 Messrs. FOWLER & SON, viz. Nos. 1, 2, 3, and 4.*

Breadth, 24 inches, corresponding to the width of navy canvas.
 The chain single, of the longs of flax.
 The shoot, of the tow of flax.
 Well wove, and close driven up.
 Thoroughly boiled and bleached, to a loss of 25 per cent.
 Will not mildew.

Is used by all the revenue cruisers, packet boats, and smacks of Great-Britain.

One suit of Bridport sails will outlast two suits of British navy canvas, as at present manufactured.

	PER YARD.
Price of Bridport Canvas, No. 1,	23½ <i>d.</i>
Price of navy canvas, do.	20 <i>d.</i>
2 yards of navy canvas, at 20 <i>d.</i>	40 <i>d.</i>
1 yard of Bridport, at 23½ <i>d.</i>	23½ <i>d.</i>
<hr/>	
Saving equal to 42 per cent.	17½ <i>d.</i>

The Bridport canvas may be further improved, by putting more yarn in the chain, like Dutch canvas, in which case the manufacturer should be allowed 1½*d.* more per yard.

2 yards of navy canvas, at 20 <i>d.</i>	40 <i>d.</i>
1 yard of Bridport, improved, at 25 <i>d.</i>	25 <i>d.</i>

Saving equal to 37 per cent. 15*d.*

But say that two suits Bridport canvas did no more than outlast three suits of navy canvass. The expense will be as follow :

3 yards of navy, at 20 <i>d.</i>	60 <i>d.</i>
2 yards Bridport improved, at 25 <i>d.</i>	50 <i>d.</i>

Saving nearly 17 per cent. 10*d.*

But say even that three suits of Caker did no more than outlast four suits of navy canvas :

4 yards navy canvas, at 20 <i>d.</i>	80 <i>d.</i>
3 yards Bridport ditto, at 25 <i>d.</i>	75 <i>d.</i>

Saving upwards of 6 per cent. 5*d.*

Besides the many advantages already stated in this paper, in consequence of the navy's being supplied with the best possible canvas.

Lastly, Lord Dundonald most earnestly recommends this paper to the perusal and consideration of the Lords of the Admiralty. The manufacturers of Bridport and Crewkerne are fully

able to supply the navy with canvas, if a proper price is allowed them for it. But they should have notice given them in time, that they may prepare the yarn early in the spring, and which should be of hemp and not of flax, at least the chain should be of hemp: the shoot may be of flax tow, as it is softer and drives up better than hemp tow, that is, unless great pains are taken to soften it by beating.

HISTORICAL Sketch of the Origin, Progress, and present State of Trade and Commerce in general, with the Produce and Manufacture of each Country in the four Quarters of the Globe.

COMMERCE may be defined to be the exchange of the natural or artificial productions of a country for those of another, either by barter, or by representative signs of their value; and as coin or bullion is the most general representative of the value of other commodities, the profits of commerce are hence frequently, but erroneously, estimated by the quantity of money it brings into a country. But a very beneficial trade may be carried on without any balance being payable in money: or that balance may (as is the case with Britain) be absorbed by payments on other accounts: for notwithstanding our commerce has long been in a very flourishing state, and has been extended to a degree unparalleled in history, yet the quantity of specie and of bullion in the country has not been materially augmented.

The most early mode of carrying on trade was obviously by barter: for it must strike every reflecting individual; that commerce is nearly co-eval with the creation; and a very small increase of mankind was sufficient to prove its utility, and to demonstrate the natural dependance our species had upon one another. By the wise dispensation of Providence, their simple occupations were suited to their wants; and the diligent discharge of the one rendered sufficient to supply the moderate demands of the other; and though agriculture, or the feeding of

flocks, were the sole labours of the first inhabitants, yet (limited as they were) they could not be exercised with that comfort their great Creator designed them, without mutual correspondence and traffic; and hence (notwithstanding the plausible and confessedly ingenious but erroneous arguments which have recently been adduced, to evince the possibility of a state existing "*independent of commerce*,") an exchange of commodities necessarily took place. Such was the origin of commerce in the infant world, and in this state it continued so long as our progenitors could content themselves with the riches of nature, and were not obliged by a growing posterity, to alter their method in disposing of them. In consequence, however, of the increase of mankind, and the progress of civilization, commercial intercourse became more extended, and other representative signs were found to be necessary. This led to the discovery of coin or money: and, as buying and selling, through that medium were found most convenient in their commercial transactions, this method was invented and adopted in lieu of barter by the most polished nations, and by whom it has been transmitted to us, with the exception of those savages, where the use of coin has hitherto remained unknown, and their traffic is carried on in the primitive way, though not always with primitive simplicity. Previously, however, to this change, and before the great increase of population, their desires were easily satisfied, being limited by their wants: they contentedly made the fleece of their sheep serve them for clothing, and their hunger found a ready supply from their gardens and kine: a neighbouring spring slacked their thirst: and a tree, or a tent, was sufficient to defend them from the inclemencies of the weather, in those climes where the first race was settled.—Their labour procured them a satisfactory support, and the products of the earth and of their cattle served them both for necessities and regales, till corruption brought in fraud: this gave birth to avarice and violence; the stronger began to invade the weaker; and, as these oppressive acquisitions could only be maintained by force and policy, cities were built, and governments formed. Afterwards, when by this means an aggregated number swelled to too great a magnitude, to have their necessities supplied by their neighbouring

territories, they were compelled to seek for remoter helps through the medium of commerce. Although it cannot be concealed that the introduction of commerce led the way to luxury and excess ; which, progressively increasing with the extension of trade, ultimately undermined that simplicity of manners, and utterly subverted the primeval state of society ; yet, the increase of mankind, and the consequent peopling of different parts and continents, rendered the continuation of commerce absolutely necessary for their comfort and support. Without this means of mutual assistance, life itself would have proved burthensome.

At length the views and designs, the desires and wants of men, expanding in proportion to the increase of population, trade was no longer confined to the providing of mere necessities, but profit was sought in, and became a motive to, the carrying it on. This motive, however, might occasionally have promoted both unity and good will among men, had the correspondence been conducted with that sincerity it ought ; and by this means rendered productive of those reciprocal benefits and advantages, which naturally accrue from the supplying the wants of one country, with the superfluities of another. And, notwithstanding the accomplishment of this desirable object has been frustrated, by the degeneracy of mankind rendering ambition and avarice the motives to the continuance and extension of trade, more than want ; yet these sinister designs have ultimately proved very beneficial to these latter ages. For, without such excitements, it is probable that the greatest part of the world would still have remained unknown to us. But instigated by the desire of gain, in order to support the one, and satisfy the other, men have made those numerous discoveries which lay hid for ages ; alike regardless of inconveniencies and of dangers, the pleasing prospect of attaining riches and preferments animated them to fresh engagements, and a succession of these, opened to us the wide field of trade that now lies before us. Whatever the motives were to the daring enterprizes of former ages, it must be confessed that we of this age are greatly indebted to the undertakers of them, for many of the comforts and conveniences of life. And as the design of this sketch is to show the advantages we receive from their labours,

and to deduce the growth and progress of trade, from its earliest beginnings, the preceding considerations, it is apprehended, will not be regarded, either as useless or irrelevant. In the subsequent pages it is proposed concisely to exhibit the beneficial influence which trade has ever had, and still has, on human affairs, and that all nations have increased in strength and power, or remain weak and abject, in proportion as they have encouraged or neglected commerce.

Whoever views the history of former ages, in the most cursory manner, will find, that the histories, even of the most warlike nations, will furnish him with as large accounts of their commerce as of their conquests; and that the narrative is equally extensive and full on the one subject as on the other.

If the greatest empires were established by valour and the force of arms, they were strengthened and supported, only, by the success, with which trade (in conjunction with the labour and industry of the people) furnished them, and the conquerors would soon have languished and perished with the conquered, had they not resorted to the riches which agriculture, manufactures, and commerce produce, in order to preserve and improve, by the tranquil arts of peace, the advantages acquired in the horrors and tumults of war.

It is by no means certain who were the first navigators in the world: the honour being claimed both for the Phenicians, and also for the Arabians. Nor, at this distance of time can this question be ascertained with any degree of precision. One fact at least is certain, that both those nations carried on commerce to a very considerable extent; while the rest of the world was utterly ignorant of the advantages resulting from foreign trade and commerce.

ON THE COMMERCE OF THE TYRIANS.

ON examining the commerce of the ancients, the Phenicians, and Tyre their capital, are the first that present themselves; and these will sufficiently prove to what a height of glory, grandeur, and riches, a nation is capable of attaining by the sole resources of commerce.

The Phenicians, it is remarked by M. Huet,* occupied only a narrow tract of land along the sea-coast; and Tyre itself was erected on an ungrateful barren soil, which, even in the most fruitful and productive seasons, was insufficient to support the great number of inhabitants, whom the first success of trade had attracted thither.

Two advantages, however, indemnified this defect; they had excellent ports on the coast of their little state, particularly of their capital; and they were born with so happy a genius for trade, as generally to be associated with the Egyptians, in the honour done these latter, by supposing them the inventors of naval commerce, particularly that of long voyages.

The Phenicians knew so happily how to profit by these two advantages; that they soon became sole masters of the seas and of commerce. Lebanon, and the other neighbouring mountains, furnished them with excellent wood for the construction of their ships; and they had in a short time numerous fleets, which ran the hazards of unknown voyages to establish their trade; and as their people multiplied almost to infinity, by the great number of strangers, whom the desire of gain, and the certain prospect of anquiring wealth, drew to their city, they found themselves in a condition to send out many colonies, particularly that famous one of Carthage, which preserved the Phenician spirit with respect to traffic, and was in no respect inferior to Tyre in point of trade, while it greatly surpassed the latter in the extent of his dominion.

The degree of glory and power to which Tyre had been raised, by commerce and navigation, rendered her so famous, that the report of prophane authors would hardly be believed destitute of exaggeration, had not the prophets themselves spoken of her with still greater magnificence; so that the description of her grandeur, of her forces, and the almost incredible number of her vessels, merchants, and merchandises, renders it impossible to pass unnoticed one of the most beautiful passages in the prophecy of Ezekiel, when we are speaking of the excellence of

* Bishop of Avranches or Soissons, in his ingenious but desultory "Treatise on the Commerce of the Ancients."

commerce, and the splendour it diffuses. Isaiah says, that Tyre is the common city of all nations, and the center of all commerce, and, in a word, is the queen of cities, of which the merchants are princes, and which has for traders the most illustrious persons of the earth. Such was the ancient Tyre when she fell under the arms of Nebuchadnezzar, after a siege of thirteen years. An asylum and resource, however, had providentially been secured by the inhabitants of this unfortunate city; for the Tyrians, during so long a siege, had both the precaution and time, to fortify a neighbouring island, where they established their maritime forces, and whither their merchants retired with their stores and merchandises, and continued a business so flourishing, that the taking and ruining of their first city, did not destroy either their empire of the sea or the reputation of their commerce.

It was this new city of Tyre, which, trusting in her riches and puissance, dared in after times to resist Alexander the Great, already master of one part of Asia, and threatened to interrupt, for some time, the course of his victories. Her temerity drew down upon her the utmost vengeance of the conqueror, by whom Tyre was entirely destroyed: and in order that no hopes might remain of being raised from her fall, he removed her marine and commerce to Alexandria, a new city, which he intended to make the capital of the empire of Asia, of which he then meditated the conquest.

COMMERCE OF THE CARTHAGINIANS.

In the mean time, the Tyrian colony of Carthage augmented its forces by trade, and thus put itself in a condition at once to dispute with Rome the empire of the world.

These new Africans soon repeated the benefits which the happy situations of their city offered, and profited by their native genius for trade and navigation. They made their fleets and merchants pass on one side to the ocean, beyond the pillars of Hercules, through the Straits of Gibraltar; and on the other, along the whole western coast of Europe; and if some accounts may be credited, their pilots and their merchants even had the

boldness, or good fortune, to be the first that penetrated to unknown lands, of which the discovery, many ages afterwards, has done so much honour, and brought so much profit to the Spaniards.

Totally immersed in their commerce, the Carthaginians never thought (till too late) of valuing themselves on the immense riches which they had thus amassed for extending their dominion abroad; but their desire of throwing off their pacific merchant state, cost them dear. Their city, which trade had peopled with above seven hundred thousand inhabitants, was soon deserted, to furnish their armies with troops and recruits. Their fleets, accustomed solely to carry their merchants and merchandise, were now laden only with soldiers and warlike stores; and of their wisest and ~~more~~ fortunate traders were formed those chiefs and generals of armies, who were destined to make Rome tremble, and put Carthage in a condition to become the mistress of the world.

The great military achievements of the Carthaginians in Sicily, Sardinia, Spain, and particularly in Italy, under the famous Hannibal, and also the disorder of their affairs by the victories of the two Scipios, are facts well known, and are of too little import to the matter now in discussion to require any detail of them. It may suffice, therefore, to add, that to so high a degree of riches and power had Carthage been raised by trade, that the Romans were engaged in a cruel and doubtful war of 50 years to subdue this rival; and in fine, triumphant Rome believed she could not entirely subjugate and reduce her by any better means than by cutting off those resources which she might yet find in trade, and which, during so long a time, had supported her against all the forces of the republic.

It was, in effect, that resolution of the senate, which decided the fate of Carthage; and the Carthaginians themselves were so terrified, that having apprehended by this design, they should be obliged to give up their fleet, and to retire inland five leagues from the sea, they chose rather to expose themselves to the hazards of the third punic war, so fatal to them, than to renounce, so easily, the only hope that could remain to them in their misfor-

tunes, and voluntary consent to see their commerce pass to Utica, whither they knew the Romans, to achieve their ruin, proposed to transfer it, as Alexander did that of Tyre, to the new city, to which he had given his name, when he determined to punish the Tyrians for having dared to retard his conquests.

COMMERCE OF THE ARABIANS.

Although it is a question involved in considerable uncertainty, whether the Arabians were the first inventors of navigation, and consequently of commerce; yet, from the peculiarly favourable situation of their country, it is highly probable they were among the first people who turned their attention to nautical pursuits. The extensive peninsula of Arabia is washed by the sea on three sides: and access to it on the fourth being rendered very difficult on account of the dangerous sandy deserts which bounded it, necessity seems to have compelled them to open communications by water with distant countries.

From the articles with which we know the Arabians supplied the Roman world, it is evident that they must have traded with India, and the principal islands (which the periodical winds denominated monsoons might enable them to do without the aid of a compass, as some do even to this day :) for gold, precious stones, rich stuffs, silks, &c. were the produce of ancient India, Arabia yielding only frankincense, balsam, myrrh, and the well known *calamus aromaticus*.

As the limits of this paper forbid the extension of the present article, we reluctantly refer the reader, who is desirous of further information on this subject, to Dr. Vincent's elaborate work "On the Commerce and Navigation of the Ancients," 2 vols. 4to, 1807.

COMMERCE OF THE EGYPTIANS.

Alexander lived too short a time to witness the happy and flourishing state to which commerce would elevate this last city. The Ptolomies, who after his death had Egypt for their part of

his conquests, took care to support the infant trade of Alexandria, and soon brought it to such a degree of perfection and extent, as to bury in oblivion both Tyre and Carthage, which, during so long a time, had carried it on, almost alone, and had re-assembled to them the commerce of all other nations.

This sudden success of the commerce of Alexandria, will cease to excite surprise, when we consider the felicity of its situation, which rendered it so commodious an emporium for all the merchandises both of the east and of the west.

On one side this famous city had a free commerce with Asia, and all the east, through the Red Sea: the same sea and the Nile, gave her entrance into the vast and rich countries of Ethiopia. The commerce of the rest of Africa and Europe, was open to her by the Mediterranean; and, if she was disposed to carry on the interior commerce of Egypt, she had, in addition to the conveniency of the Nile, and the stupendous navigable canals made by the first Egyptians; she had, I say, the help of caravans, so convenient for the safety of merchants, and for the transportation of their commodities. Further, there was added a large and safe port, where foreign vessels arrived from all parts, and whence the Egyptian vessels were constantly conveying their merchants and commerce to all parts of the then known world.

It was this conveniency of depositing merchandise at Alexandria, that spread through all Egypt those immense riches, which rendered their kings sufficiently powerful to support themselves, for more than an age, against the Romans, who endeavoured from time to time, to subdue so fine a kingdom: so considerable indeed were these riches, that historians affirm, that the product only of the customs of importation and exportation, upon the merchandises that passed the custom-houses of Alexandria, amounted annually to about 2,250,000*l.* sterling, (a vast sum in those days,) notwithstanding the major part of the Ptolomies levied but moderate imposts on their people.

COMMERCE OF THE ROMANS.

Previously to the battle of Actium, the Romans had always found, in the spoils of the nations they had subjected, resources from which they could fill the treasury of the Republic, and at the same time furnished a sufficiency for the expenses, in which the plan of a universal monarchy continually engaged them. But when the resources began to fail them, the commerce of Egypt seemed well calculated to support by its riches, (and we may add by its credit) the reputation and empire of Rome.

From the time Augustus reduced this kingdom to a province, he earnestly endeavoured to make the trade of Alexandria more flourishing than ever; and at the same time he augmented that commerce, which the Egyptians had always maintained, or carried on in Arabia, the Indies, and to the most remote parts of the east, through the Channel offered by the Red Sea.

Under such auspices Alexandria became inferior only to Rome itself, in grandeur and in population. The magazines of the capital of the world, were no longer filled but with the merchandises which came to it from the capital of Egypt; and in a very short time not only Rome, but all Italy were indebted for their subsistence to the vast quantity of corn and other provisions, brought by the merchants and Egyptian fleets. So great were this quantity and abundance, that the historian, Josephus, affirms, that Alexandria yielded more riches to the Roman treasury in one month, than all Egypt in a year: although, if Pliny's calculation is to be credited, the profits of the Egyptian commerce amounted yearly for Rome, to 125,000,000 crowns, (upwards of 28,000,000*l.* sterling), that is to say, a hundred times more than the Romans employed, whose ordinary expenses did not amount to above 1,250,000 crowns.

This great trade, (which soon caused that of all the other provinces of the empire to flourish) augmented incessantly, and made the senate determine to maintain it by the corporations it established in Rome, for trade and traders, by the laws which it made in their favour, (or rather by those of the Rhodians, which

it adopted, and which are long since become a species of the law of nations, for the navigation and commerce of the Mediterranean) by the magistracy whom it charged with their execution, and by the protection which it afforded to the merchants, as well strangers as Romans, in all the extent of the empire.

At length, Alexandria met with the fortune of Tyre and of Carthage. She had been raised by trade, and the fall of her trade overset her. The Saracens, who seized on Egypt, in the reign of Heraclius, having, by their cruelties, driven away the merchants, this city, which then held the first rank after Rome and Constantinople, hardly preserved any thing of her ancient splendour; and though she afterwards regained some vigour under the Sultans, and has continued to flourish, in some degree, from the Christian nations, which carry on the Levant trade, and maintain a tolerable good business; it is, however, no longer possible to recognise that ancient Alexandria, so famous for her trade, and which was for so long a time the glory and support of an empire, founded indeed, by arms, but which received its principal strength from commerce.

COMMERCE OF GAUL.

BEFORE we notice the commerce of the moderns, it may be proper to annex a few particulars respecting those cities of ancient Gaul, which were formerly rendered famous by the enterprises of their merchants.

Massilia, or Marseilles, the most ancient ally of the Romans, was equally celebrated for its antiquity, for the wisdom and equity of its senate, for the sciences taught in its academies, for the many colonies it established, and for the wars it gloriously maintained against so many different people, jealous of its riches; but for these advantages it was indebted only to its trade: and it was solely by means of commerce, that it arrived in so short a time, to that high point of respect and power, as to render it for a long time the arbitrator of the neighbouring nations, who were attracted thither to learn the arts and politeness of Greece,

which its first inhabitants brought from Asia, when they left it, to settle among the Gauls.

The example of Marseilles soon animated the greatest part of the Gallic or French cities to trade, more especially such as were situated upon the same sea, or that were not far distant. Arles became famous for its experience in navigation, and for its ability in the art of building ships. It likewise distinguished itself for the invention of curious manufactures, and above all for its works in gold and silver, which gave it a great reputation. Narbonne even yet exceeded Arles, and so long as its port existed, it saw fleets arrive there from the East, Africa, Spain, and Sicily, laden with every kind of merchandise; while the inhabitants on their side, equipped their own ships to carry abroad the products of their country, or the manufactures which their own industry had raised.

When the alteration of the course of the River Aude, had occasioned its deserting the port of Narbonne, Montpellier arose upon the decline of the former: and the latter city now received in her own harbour ships from all parts of the Mediterranean.

Besides the cities here mentioned, there were several others which flourished in a considerable degree, from the influx of wealth occasioned by commerce, although they were considerably inferior. Among these, may be noticed Toulon, Frejus, &c. and particularly Aigue-Morte, before the sands of the Rhone had left it at a distance from the sea. From this last port it was, that the embarkations were made in the reign of St. Lewis for those romantic expeditions, the Crusades; which, by draining the different countries of their most turbulent subjects, and by promoting a more extensively mutual intercourse, did unquestionably tend to promote civilization of manners, as well as to improve commercial and nautical science.

In the interior of ancient Gaul, the principal emporium was Lyons; which being situated at the confluence of the Rhone and Saone, became a general staple or warehouse for all the various articles of the then French trade; exclusive of the commerce which she carried on with Egypt and the Levant by means of her correspondence with Arles and Marseilles.

At this period the ancient history of commerce properly terminates. We shall review its progress, during the middle ages, and thenceforward trace its course down to the present time.

THE HANSEATIC LEAGUE.

THE fall of the Roman Empire involved in its destruction the ruin of all the people who had submitted to its sway. The inundation of the Barbarians, which proved so fatal to the sciences and polite arts, operated with equal detriment to trade: and, as the learned beheld their libraries and the finest monuments of art and of literature remedilessly sacrificed to the flames, by a people, equally ignorant and fierce, so neither had the merchants more ability to rescue from their fury their numerous fleets, (which covered the seas,) or their vast magazines and warehouses, which were constantly full of the most useful as well as valuable articles of commerce. Hence it necessarily followed, that while these sanguinary hordes were contending with the Roman arms, or were disputing among themselves for the possession of the countries they had usurped, all their commerce consisted only in the spoils of the vanquished: nor had they any other trade but the dividing of the immense treasures which they had found amassed in all the towns of the empire they had sacked, and especially in Rome, the metropolis of the then known world; which repeatedly became a prey to their fury and to their avarice.

But the intercourse, which insensibly was promoted between the victors and the vanquished, contributed by imperceptible gradations to soften the ferocious manners of the former; and after the establishment of the powerful monarchies that arose on the ruins of the Roman empire, the conquerors soon learned from the people, whom they had subjugated and with whom they associated, the necessity of commerce, and the means of carrying it on with success. Some of the most sanguinary of these Barbarians, shortly afterwards, became so expert in trade, that they were enabled to impart its principle to others; and to the Lombards are we indebted for the invention and usage of

the Banking System, Exchanges, the principles of Book-Keeping with double entries, and various other practices, which facilitate and secure commercial intercourse.

From the imperfect information which the scanty annals of the middle ages will afford, it appears that trade began to recover from the shock occasioned by the subversion of the Roman empire, first in the southern parts of Europe, and very shortly afterwards (if not contemporaneously) in the northern coasts of that quarter of the globe. A Society of Merchants was there formed, which not only brought commerce to all the perfection it was capable of acquiring, previously to the discovery of America and the East and West Indies; but which also began to give it those laws which have continued in force under the name of *Uses* and *Maritime Customs*, and to form a kind of code, the first, indeed, of those which have been made for the regulation of trade.

This society was the celebrated association of the Hanse-towns, better known in history under the name of

THE HANSEATIC LEAGUE.

These towns were originally a confederacy, united in alliance for the mutual support and encouragement of their commerce; at no period, does the history of the world present a more extraordinary example of the effects which industry and a strict union of interests can produce, than this singular confederacy; which was first set on foot by the city of Bremen and several sea-port towns in Livonia, about the year 1169, although some historians* post-date it to 1200, and 1241. In the first mentioned year, the destruction of the two commercial cities of Julian and Winnet by the Danes, and other pirates of the north, dispersed their merchants into the cities of Lubeck, Rostock, &c. which had recently been erected on and near the Baltic Sea,

*De Thou, and Lambecius: See Anderson's History of Commerce, under the year 1169. Oddy's European Commerce, 4to. 1805. Mr. Butler's Revolutions of the Germanic Empire, 8vo. 1807, Mallet, de la Ligue Hanseatique, 8vo. 1805.

and thus occasioned the Mercantile Association, whose principles and trade, the subsequent pages are to disclose. These cities were anxious to protect themselves against a similar calamity: the first that entered into this association were Lubeck, Wismar, Rostock, Straelsund or Stralsund, Grypeswald, Anclam, Stettin, Colberg, Stolpe, Dantzic, Elbing, and Konigsberg. The advantages which they derived from the confederacy attracted other trading towns to it: and at one time eighty towns or cities were enumerated among the association. They were divided into four classes:

I. The Vandalic, which comprised the towns on the Baltic between Hamburg and Pomerania. Over this division presided Lubeck; whose power and opulence rendered her the head of the union: to this city were committed the common stock and records of the confederacy, and here the general assemblies of the association were held.

II. The Rhenaan, over which Cologne presided, included the towns situated on the Banks of the Rhine in the then territories of Cleves, Overysse, Guelderland, Mark, and Westphalia.

III. The Saxon, contained the towns in Saxony, of which Brunswick was the head.

IV. The Prussian comprehended the towns of Prussia and Livonia, which were under the direction of Dantzic.

There was, however, another general division of the Union towns into Easterlings, (which included the towns on the coast of the Baltic), and Westerlings; which (as the name imports) comprised those situated towards the Rhine, of which Cologne was the principal, as Lubeck was the head of the eastern Hanse-towns. Of many of the places, which entered into this confederacy, not a single vestige now remains: and as such of the towns, as still retain any degree of their commercial prosperity, will be noticed in future numbers, under the respective countries with which we at present have, or lately had, any commercial intercourse, a few particulars respecting the regulations and principles of the *Hanseatic League* shall now be presented to our Readers.

It was a standing rule of the Hanseatic Confederacy, that no city should be admitted into it, which was not situated either on the sea, or on some neighbouring river that was commodious for maritime commerce, and which did not keep the keys of its own gates. Another permanent regulation was, that each member of the association should have the civil jurisdiction in its own hands, although in other respects such city was allowed to acknowledge a superior lord.

At a period like this (the thirteenth century), when war and military exploits constituted the principal glory and employment of sovereigns, princes, and feudal chieftains, the policy of these trading republics was necessarily productive of benefit; and the prudence, with which their commercial concerns were conducted, was equally conspicuous in their choice of the person whom they selected for their protector. As it was expedient to choose one who was a member of the German empire, they elected the Grand Master and German Knights of the Cross, (better known in after ages by the appellation of the Teutonic Order), who were established in Prussia, and had recently conquered the province of Livonia. By this means the Hanse-towns became possessed of all the commerce of the Baltic, from Denmark to the bottom of the Gulph of Finland, together with the trade of the rivers, which discharge themselves into that sea from the interior of a fine country, yielding a great variety of articles that were of considerable value and important in the commerce of the world. The Hanseatic Confederacy* convened an extraordinary general assembly every ten years, at which the Union was solemnly renewed; new members were admitted; and old member were excluded, if proper reasons were assigned. This league was solemnly renewed in the year 1284, and was afterwards repeatedly confirmed in succeeding ages.

In proportion as the reputation, opulence and forces of the confederacy increased, there were few trading towns of note in Europe that were not associated with it; rather, it should seem, as

* Oddy's European Commerce, p. 12. Anderson's History of Commerce, vol. 1. p. 87, folio edi.

factories and warehouses, than as members of the corporation personally represented at the general assemblies.

Thus, France furnished to the confederation, Rouen, St. Malo, Bourdeaux, Bayonne, and Marseilles—Spain, Cadiz, Barcelona, and Seville—Portugal, Lisbon—Italy and Sicily, Messina, Leghorn and Naples—Russia, Novogorod—Norway, Bergen—The Low Countries or Netherlands, Antwerp, Dort, Amsterdam, Rotterdam, Ostend, Dunkirk, and especially Bruges, which was one of the wealthiest cities in Europe, and in 1310 contained not less than sixty-eight companies of traders and artificers; while its citizens rivalled many of the European monarchs in their sumptuous mode of living. Some idea of their splendor may be formed, from the following anecdote recorded by Dr. Robinson;* who relates that, in the year 1301, Joanna of Navarre, the wife of Philip the fair, King of France, having been some days in Bruges, was so much struck with its grandeur and wealth, and particularly with the splendid appearance of the citizens' wives, that she was moved by female envy to exclaim with indignation, "I thought that I had been the only queen here, but I find that there are many hundreds more."

In consequence of a dispute with the emperor Maximilian, Bruges was deprived of a considerable part of its trade, and from that time the city of Antwerp took the lead in commerce; but taxes and imprudent regulations insensibly undermined the general trade of the Netherlands, and carried part of it to England, and the remainder into Holland. Few persons have seen, without surprise, the long and splendid line of towns between Ostend and Liege. When we consider, that they have survived their commerce for more than two hundred years, we may form some notion of the general populousness and magnificence of the territory and its inhabitants in the day of their prosperity.

Lastly *England* furnished London to this celebrated Association whose warehouses and factory were at the very spacious building then called and now in existence by the name of the

* Historical Disquisition concerning India, p. 239.

Steel-Yard. Here they carried on a most extensive and lucrative trade* in every article of necessities and of luxury then known; being favoured by numerous privileges which had been conceded at various times by different English Sovereigns, and which they retained till the time of Edward VI. when the British Merchants most severely felt the inconvenience of such exclusive privileges. The Merchants supported their own claims, by accusing the Hanseatics of monopoly, of defrauding the customs, of extending the privileges granted to them far beyond the original intention, which only went to give to certain towns privileges relative to articles of their own produce; whereas they had become general merchants, and had extended the same advantages to places never intended. England, which had long been rising in the woollen manufacture, as a rival to Flanders, possessed none of the advantages of foreign trade; for, of the cloths manufactured, not one-twentieth were exported by English merchants, but the whole nearly by those of the Hanseatic towns.

When, with the advice of the Privy Council, Edward VI. deprived the Hanseatics of their privileges, the case was instantly reversed, and the export trade fell nearly all into the hands of English merchants.

The privileges of the Hanseatic body, at the Steel-yard, were again restored by Queen Mary, who was married to Philip, the son of the Emperor; but this was of short duration, and a conclusion to their successful convention with England was put in the following reign of Elizabeth; when the Hanse Towns, in conjunction with the Emperor of Germany, mistaking their own power, and the vigour and wisdom of the English Queen, banished all the English merchant-adventurers, with a view to compel her to renew the privileges in England that had first been revo-

* The articles imported by the Easterlings into England were corn, cordage, linen, cloth, hemp, flax, pitch, tar, masts, pipe staves, steel, iron, wax, wainscot; but, as corn, of which they imported great quantities, sometimes arrived when the prices were very low, the proprietors of land and farmers complained, and an act was in consequence passed, in the reign of Edward IV. (in 1463), by which corn imported was forfeited, when the price of wheat was under 6s. 8d. the quarter, rye, 4s. and barley 3s. This act was not repealed till the time of James I. near two hundred and fifty years after.

red during the short reign of her brother Edward, and renewed by Mary, but again suspended.

The effect produced was directly opposite from that intended, and, instead of renewing the privileges, that spirited Queen ordered the Steel-yard-house to be shut up on the same day that the English merchants were ordered to quit Germany; thereby putting an entire stop to this commerce, which, by means of their great capital and superior knowledge, was still considerable, though not protected by any peculiar privilege, as they had only traded for some time on the footing of her Majesty's subjects.

This unfortunate retaliation occasioned an assembly of some of the principal members of the League at Lubeck, in 1591, when they remonstrated in a style of indignation, reproach, and menace; to which Queen Elizabeth answered, that she was willing to attribute their want of respect to their secretary, but that she set no sort of value on their hostile intentions.

There is no doubt that the assistance which those towns had attempted to give in fitting out the great Armada* for the invasion of this country, had not a little contributed to this inflexible severity; but it was an effect arising from the progress of things which must very soon have been produced.

Originally, it may be recollected, the only objects of the confederacy were,—to secure their commerce against the pirates and plunderers of Denmark and Norway, who from the ninth to the twelfth century had desolated Europe, and held the absolute dominion of the seas;—and also by peaceable and friendly communications to extend their trade. By their prudent management, in the course of time, we have seen them rise to such a degree of power as to engage in treaties, and to insist in high language on having their own terms granted by the sovereigns with whom they entered into negotiations. The most flourishing period of the Hanseatic league was, at the end of the fourteenth, and the beginning of the fifteenth century. It then presumed to declare and to carry on offensive and defensive wars with the sovereigns of Europe, over whose fleets and land-forces they

* Sixty ships laden with stores for Spain, belonging to the Hanse Towns, were taken or destroyed by the English.

frequently obtained signal victories, which for a short time procured the advantages thereby sought to be obtained.

For instance, in 1348,* the League engaged in a naval war with Waldemar III. King of Denmark; which was occasioned by that monarch demanding toll for vessels passing the Sound. The circumstances of the contest are not well known; but that it terminated in favour of the League is clear, from this circumstance, that the king was glad, in order to obtain peace, to grant them the province of Schonen, for thirteen years, by way of indemnity. This is the first account existing of any toll demanded in passing the Sound, which has since been the cause of much vexation to the commercial world. Soon after, another war broke out between those same merchants and the king of Denmark, which ended much more gloriously for the former. In 1395, the Hanseatic League triumphed† over Queen Margaret of Denmark, a woman of great abilities and enterprize, and who had united, under her single authority, Denmark, Sweden, and Norway. They compelled her to deliver up King Albert and his son, who were her prisoners, and also to give them Stockholm. The cities of Lubeck, Hamburg, Dantzick, and five others of the Hanseatic League, bound themselves in the sum of 60,000 marks, that King Albert should, within three years, resign the whole kingdom of Sweden.

But the most celebrated expedition of the Hanse Towns was undertaken in the year 1428; when the *Vandallic Division* (comprising the towns on the coasts of the Baltic,) fitted out a fleet at the port of Wismar, consisting of 260 ships, carrying 12,000 men, exclusive of the sailors, which were designed to destroy Copenhagen a second time, (they had succeeded in taking the city in 1362); but, notwithstanding their numbers and their force, this design was frustrated.

It was, unquestionably, at this time that the Hanseatic League attained the summit of their power: Nor, perhaps do the annals of history at any period of the world present a more striking instance of the great object which may be achieved by a strict

* Anderson, vol. 1. p. 178.

† Ibid, vol. 1. p. 220.

union of interests. But from this time, the decline of the union must be dated. Their fall, Mr. Oddy justly remarks, began in their becoming warlike instead of commercial, and preferring political importance to wealth obtained by their original modes. The rise of Holland accelerated their decline; and the general attention which other nations began to pay to manufactures and commerce, by distributing them more equally amongst people, in different parts of Europe, destroyed that superiority which the northern nations had so long enjoyed.

In addition to this circumstance, the discovery of the passage to India, by the Cape of Good Hope, and of America, with the facility which the discovery of the magnetic needle had given to the navigation of the ocean, produced a great change, and it was of an unfavourable nature for these towns. In the first place, the Italian cities, which had till then possessed exclusively the commerce with Asia, lost that lucrative trade, the whole of which fell into the hands of the Portuguese; who nevertheless, still found it necessary to have their depôts, for the north of Europe, in the same cities as the Venetians and Genoese had formerly done; but this was not of any long duration; for the Dutch soon getting a footing in India, drew that commerce to themselves; and therefore had no occasion for depôts, at Bruges, Antwerp, or any other places in the north.

The persecutions of the Spaniards drove many of the most industrious of the inhabitants of the Netherlands into England and other countries. Thus the manufactures declined; and the Dutch, discovering a better method of curing herrings than had before been known, drew that trade, as well as that of India, to themselves.

The number and variety of the military undertakings in which the Hanse Towns embarked, contributed more powerfully perhaps than any of the causes above specified to accelerate their ruin. A general jealousy was raised; and the Kings of France, Spain, and Denmark, and several states of Italy, forbid their towns to continue members of the confederacy. Upon this, the Teutonic Hanse Towns restricted the confederacy to Germany,

and distributed its towns under four metropolitan towns,—Lubeck, Cologne, Brunswick, and Dantzic. Brunswick and Cologne afterwards separated from them ; several towns followed their example, so that about the middle of the seventeenth century, the confederacy was almost wholly confined to the towns of Hamburg, Lubeck, and Bremen. They retained the appellation of the Hanseatic towns, and claimed their former privileges. Under the appellation of Hanse Towns they were recognised at the peace of Utrecht in 1715, and at the Definitive Treaty of Indemnity in 1805 ;—almost the last moment of their political existence.

REMARKS.

THE object in these historical sketches appears to be, to prove the great benefit of commerce to all nations ; but in attempting to establish this truism, the following unqualified assertion is made ; “ *that all nations have increased in strength and power, or remain weak and abject in proportion as they have encouraged commerce.*” (See page 142.) To make this position good, an account of the Phenicians and the trade of Tyre, it is said (page 142,) “ will sufficiently prove to what a height of glory, grandeur, and riches a nation is capable of attaining by the *sole* resources of commerce.” After expatiating, however, on the opulence and splendour of that once celebrated city, and calling in the authority of Isaiah, who said that Tyre is the “ queen of cities, of which the merchants are princes, and which has for traders, the most illustrious persons of the earth,” the writer exclaims, (page 144,) “ Such was the ancient Tyre *when she fell under the arms of Nebuchadnezzar*, after a siege of thirteen years.” But the Tyrians, it is said, had retreated to an island which they strongly fortified, and continued a business so flourishing, that the loss of their city did not destroy either their “ empire of the sea or the reputation of their commerce.” The next paragraph, however, informs us, that this new city of Tyre, *trusting to her riches and puissance*, dared to resist Alexander the Great, and

her temerity drew down upon her the utmost vengeance of the conqueror, by whom *Tyre was entirely destroyed.*" Thus ended the boasted wealth and riches, the opulence and power, the greatness and glory of the commercial city of Tyre.

It is rather unlucky, that the Tyrians should have wound up their accounts so unfavourably for themselves, and not a happy illustration of the position ; as the reader may be apt to suspect that *all* nations have *not* increased in strength and power, or remain weak and abject in proportion as they have encouraged commerce : But what is still worse, the Carthaginian traders, with all their wealth and riches, shared a fate similar to that of their Tyrian predecessors ; and if we approach nearer to our own times, and review the famous Hanseatic League, we will find from indubitable authority, that the gains of commerce are not the si-
news of the state.

Mr. Oddy ascribes the downfall of the Hanse confederacy to their becoming warlike, and "preferring political importance to wealth obtained by their original modes ;" but does not the experience of all history teach us, that no nation can long enjoy the blessing of peace, and commercial states are more exposed to the hostility of their neighbours than others ; for the multiplicity of their concerns, the extent of their transactions, and we may add, the restless nature of commerce, which searches in all seas and pervades all countries, must interfere with the policy of foreign nations, or clash with their interests ; hence irritation arises, which frequently terminates in open war. It is probable, that no system of policy, however wise or moderate, could have prevented the wars in which the Hanseatic League were involved ; but we are sure, that most of them were undertaken in defence of their trade, or to repel the encroachments of their neighbours, whose envy and jealousy were excited by the showy but unstable wealth of these cities ; and their fate, like that of Tyre and Carthage, affords a convincing proof that something more substantial than commerce is requisite to maintain the independence of any nation.

Another proof of the weakness of the assertion, that "commerce alone is sufficient to insure greatness," is derived from the

fact with respect to England. Were she to adopt the premises and conclusions of the author of the preceding paper, and to reason from analogy, or were she to rest on the extent and magnitude of her trade alone, she might justly dread the threats of Napoleon, and tremble for the duration of her empire. Tyre and Carthage were denied an extensive and productive territory, and could boast of nothing but their ships, their warehouses, and merchandise, while England can add to these, the vast resources of her agricultural industry. The combination of agriculture, manufactures, and commerce, is the true cause of the greatness, the opulence, and the power of Britain; it ought therefore to be the policy of the rulers of that country to guard the progress of these great branches with the same fostering care and protection, to encourage each without depressing the other, and to watch their reciprocal bearings, connexion, and affinity, that the general interest may be promoted, and the resources consolidated into a mass of strength adequate or superior to the power of her enemies. The same policy should be adopted by the United States.

It is scarcely to be expected, that any state whatever can enjoy undisturbed commerce for a length of time, or that it can avoid falling a victim to the avarice, envy, or rapacity of its neighbours, unless it be in a situation to maintain its rights; for notwithstanding the law of nations, the faith of treaties, and the sanctity of regal compacts, yet these we find, are but feeble barriers against force and the turbulent passions of men; for the arm of power, supported by military skill, has ever decided the destinies of empires; and justice, humanity, and truth cannot shield the weak from the aggressions of the strong.* This was exactly the case with the Phenicians, the Carthaginians, and others, for they were possessed of no resource but that which arose from commerce, and it was to be seen only in their elegant palaces, their splendid dresses, and luxurious banquets. They wanted a hardy peasantry to defend them from the inroads of less wealthy na-

* The depredations of England and France on American commerce; the impressment of our seamen, the murder of our citizens in our own ports by their ships of war, and the attack on our national vessels in our own waters, all prove the truth of the above position.

tions, they wanted the real sinews of power, for their whole exertions were directed to the attainment of the refinements of life, rather than to the productions of the earth, and their territory was limited to the walls of a city, the inhabitants of which, had to draw their precarious support from others by means of their trade. War must be ruinous to such states, as it impedes commerce, on which hinges their very existence. With resources so limited, it is not to be wondered that Tyre should fall before the hero of Macedon, or Carthage before Rome. The Scipios knew well where Carthage was vulnerable, and they carried the war to the gates of their city—it was there she received, and was unable to withstand the blow—it was there that her gold and her glittering toys were unavailing.

It is different with Britain; indeed there is no parallel, for her people possess a highly fertile country, which is capable of maintaining great armies, and affording all the necessary supplies for war; but it is too common to ascribe her prosperity solely to her commerce, entirely overlooking or not properly appreciating the value of her agricultural industry. This delusion in some measure proceeds from a misconception of the nature and consequences of foreign trade, arising principally from a comparison of the amount of the nominal price of their export and import commodities.

It must be extremely difficult to establish any data for ascertaining the profit on commerce, as the advantages derived from it are blended with the produce of land, and with manufactures; and the whole form an aggregate, that constitutes the wealth of nations. It is not easy to separate objects so intimately connected; but when we allow that commerce, by the intercourse it induces, contributes to civilize mankind, and to diffuse knowledge, with all those refinements which spring from human ingenuity, we raise its value higher in the scale of importance, than the rigid calculator who estimates its benefits by pounds, shillings, and pence. But whatever may be the profit on foreign commerce, its fleeting and precarious nature greatly diminishes its value to any nation, and in no respect, can it rise to a comparison with agriculture or internal trade; for the protection of commerce, is maritime power, or

naval superiority, which again depends on many contingent circumstances, often beyond the control of the most watchful precaution; and within our own times, we have seen the commerce of France, of Spain, and of Holland, annihilated by the bravery of British seamen. On the other hand, the empire of China is a happy illustration of the stability of the beneficial effects which result from internal industry; for her exports and imports are trifling and unimportant when compared with her immense wealth and numerous population; and yet her prosperity has already continued for a period of ages more remote than the records of Europe.

There is nothing of more importance to any country than a clear and distinct acquaintance with its own resources, as it enables the government and people to pursue those objects which conduce to their prosperity and happiness; it is therefore our duty, on all occasions, to inculcate true principles, how disagreeable soever they may be to the selfish and interested, and it is only by fair and free discussion that we can ever arrive at just conclusions; but to question generally received opinions, is always an ungracious task, as the inquirer has to contend not only with the subtlety of argument, but with the passions and prejudices of men. It would therefore be no easy matter to convince the great and respectable body of merchants in England, or America, that commerce is only of secondary importance to a nation, and that her wealth and power are principally derived from the fertility of her soil, which is the basis of all her greatness, and the only sure foundation on which an empire can be raised.

By referring to the history of nations, the faithful records of all ages will present us with some indisputable truths; and there is nothing more certain than that commercial states have always been ephemeral, or their greatness fleeting, and their splendour momentary; for commerce is easily removed, it is floating property that can be transplanted to any country, and the conqueror has generally carried it to his own, or established it on some favoured spot. But it is otherwise with agricultural improvement and the produce of the earth, for the warrior always respects it, as he is dependant upon it for supplying his armies, and enabling him to make new conquests. He must desolate an agricultural

country by fire and sword, and the extirpation of the people, or it will still continue great and flourishing; but it has oftener happened that the conqueror has assimilated with such a country,* as in the case of the Tartars and Chinese; and how often have the Netherlands been overrun by hostile armies, yet they are still a prosperous country, by means of the fertility of the soil and the industry of the people. The improvement of the land, and internal industry, may therefore be held preeminent to foreign commerce and the other pursuits of mankind; and *that* nation must be great and powerful which directs its exertions to such objects.

ACCOUNT OF MAKING SPANISH WHITE AND PARIS WHITE.

[*By a Manufacturer.*]

SPANISH White is nothing but chalk, ground generally in tubs, the bottom of which is paved with small stones of a hard quality, or has one large hard bed-stone instead thereof, and a stone on edge is fixed to an upright axle, both which go round by the means of a water-wheel, steam-engine, or horses.

The chalk is broke into small lumps about four ounces each, and thrown into the tub in which it is ground, but the tub is previously charged with a large quantity of water, and as the grinding operation commences, the chalk unites with the water, its finer particles rise to the surface, and as a small stream of water is constantly running into the tub, and fresh quantities of chalk

* Many thousands of the soldiers of the Prince of Hesse Cassel, hired to England to assist in the reduction of America, preferred remaining here to returning home, after the revolutionary war. The case is not exactly parallel with that of the Chinese and Tartars; for the Hessians had their choice to stay or return. The Prince was not anxious for their return, as he was thus saved the expense of transportation, and he had men enough left for future contracts.

are added, the level of the mixture rises to a certain height, finds its way through an aperture of the tub near the top, and is discharged into a large reservoir, by which the two operations of grinding and washing are performed at the same time with a small expense. After the ground chalk has stood a sufficient time to subside, the water is run off, and the chalk being so stiff as to cut with a spade, is then removed to a place to dry, either by the air or by stove heat: the former of these is termed *stiffening*, the latter is called *drying*, and is the finishing process.

Chalk taken into the north coasts of England, at the chalk wharfs on the Thames, about 2s. 6d. per ton, and when made into Whiting in the North, sells from 16s. to 20s. per ton.

French Whiting, or Paris White, has not been made in England above 50 or 60 years; the manufacture of it was brought by a Dutchman, who settled in a sea-port town in Yorkshire, and who, by it, and his mode of refining and depurating rapeseed oil, and linseed oil, acquired a large fortune, and became a respectable banker.

ON BLEACHING.

THERE are three methods—The Dutch, the Irish, and the new or French method.

The Dutch method is very particularly described by Lewis Cromelin, and copied by the late Dr. Home and the compilers of the *Encyclopædia Britannica*. As each of the methods in the first and the last parts of the process coincide, it is unnecessary to describe each at full length.

The first operation is steeping in warm water, of the temperature of 180° of Farenheit's thermometer; bran is often added to promote the fermentation brought on by the dressing used by the weavers; the fermentation appears by the air-bubbles which rise to the surface, by the swelling of the cloth, and the scum which rises to the top; this fermentation is acid, and accelerates the pro-

cess of bleaching ; it continues thirty-six or forty-eight hours ; when the scum begins to fall, the putrefactive fermentation commences ; the cloth is then drawn, washed, and laid on the grass ; when dry, it is fit either for the Dutch or Irish method of bleaching.

Before we attempt to account for the effects of bleaching stuffs, and before we determine which method is to be preferred, we should ascertain the properties of the colouring matter of linen and its solvents. With this intention Mr. Kirwan took five quarts of burnt ley, in which yarn had been boiled,* added two ounces weak marine acid ; this did not occasion any effervescence, but a deposition of a sediment of a greyish green colour, which was insoluble in boiling water ; when dried it assumed a shining black colour, but internally it remained of a greenish yellow ; it weighed one ounce and a half ; it was insoluble in oil of turpentine, or linseed oil ; it communicated a brownish tinge to the sulphuric and marine acids, and a greenish to the nitrous ; it was not sensibly diminished by either of them.

He then dissolved one ounce of sweet barilha, Dantzic pearl-ash, Cunnamara kelp, Cashup and Clark's pearl-ash, in six ounces of pure water each, and digested eight grains of the green colouring matter in an ounce of ley made from each kind of those ashes in the temperature of 180° during three hours and a half. Two ounces of the barilha ley, one and a half ounces of the Dantzic, one and one-half ounce of kelp, one ounce of the Cashup, one ounce of Clark's dissolved the whole. He found that liver of sulphur is of all alkaline compounds the most powerful solvent of the colouring matter ; hence, kelp which contains it, affords a ley which may be advantageously used in the first process of bleaching ; so may the solutions of Cashup, and markoff, and artificial sulphurets.

The caustic vegetable alkali is most powerful, next to liver of sulphur ; next to this, caustic mineral alkali ; mild mineral and mild vegetable alkali occupy the last place. Solution of Windsor soap dissolved a very small quantity, and lime water scarce any

* Transactions of the Royal Irish Academy, vol. III.

of it; as one pound of lime water contains about thirteen grains of lime, its solvent powers must therefore be very weak.

Any ash ley may be converted into solution of liver of sulphur, by adding to it, when boiling, of sulphur one-twentieth part of the weight of pure alkali contained in it.

The DUTCH method consists in steeping the cloth in warm ley, but not boiling it, as the Irish do; this operation is performed in the following manner; different kinds of ashes, such as blue, white, pearl, markoff, Cashup, and Muscovy ashes are dissolved in water, with a few pounds of soft soap. The cloth is brought in dry from the green, and put into a large vat, the ley at a 100° is thrown on it, when it continues a few hours in this steep, the ley is drawn off, and then heated to 180° ; this is repeated six or seven hours, and the degree of heat gradually increased till it is at last thrown on boiling hot; when the cloth hath remained in this three or four hours, the ley is let off and thrown away.

The cloth is then laid on the green and watered for six hours, afterwards it is allowed to lie till white spots appear on it before it is watered; next day it is watered twice or thrice, if the weather is dry; the third day it is lifted and passed through the same course of bucking as before. This alternate course of bucking and watering is repeated ten or sixteen times, before it is fit for souring. After souring, it is rinsed, mill-washed, and rubbed by women's hands, in soap and water; it is then sent to be bucked in ley rather stronger than formerly, which is gradually increased in strength till the cloth is of a uniform white, then the ley is weakened gradually, every course of bucking, till the process of bleaching is finished.*

The IRISH method commences as the Dutch, with macerating in warm water, thirty-six or forty-eight hours† (the degree of heat of the water is lower when the temperature of the air is warm, higher when cold) it is then washed, grassed, and boiled alternately, till fit for the sour and the boards.

* Home's Experiments on Bleaching.

† If burnt ley is used in this steep, it will stain the cloth and prevent the acid fermentation of the dressing, which if encouraged, would dissolve the alkaline compound, precipitated upon the yarn, at the time of boiling.

As the extent of our manufacture prevents the practice of watering, the ley is washed out of the cloth after each boil, before it is exposed to the sun and air : this should be done with the utmost care in warm weather, else the alkali may crystallize on the cloth and make it tender.

As this is the part of the process in which the Dutch and Irish methods differ, the subject is of material importance ; the improvements in the arts enable us to determine a dispute which has continued one hundred years.

We have seen that the principal part of the colouring matter of linen is a resin, which, like lac, is insoluble in water, and in oils ; but can easily be dissolved in alkaline caustic leys ; heat promotes the action of solvents upon lac. A high degree of temperature greatly promotes and assists the action of alkalies upon the colouring matter. This, and some other facts mentioned hereafter, are in favour of the Irish method of bleaching.

Bleaching by alkali, purified of carbonic acid by lime, assisted by a high temperature, has been long practised in secret in the Levant ; it is now practised as a recent and valuable discovery, and was first published by Chaptal. In this method, a small quantity of ley is put into the bottom of a boiler. Cloth or yarn steeped in the same kind of ley is loosely thrown into the boiler, and suspended in it on racks or grates of wood ; it is closed with a steam-tight cover, and to prevent accidents from the violent expansion of steam in a high temperature, a safety valve is attached to it. Heat is then applied a few hours, the steam and heat are equally diffused, penetrate the fibrous texture of each thread, increase the solvent power of the alkali ; the colouring matter is completely and speedily united with the ley, and easily removed by washing. As the action of soda upon cloth, even in its pure and caustic state, is less violent than the action of pot-ash, our attempts to bleach in this way, should commence with ley of soda, and our first essays should be on a small scale.

The apparatus for bleaching with caustic alkaline vapour is described by Chaptal, and improved by O'Reilly in his Essay on Bleaching ; a description and drawing of it are in the 10th vol. of the Philosophical Magazine.

A small boiler is set in a furnace, on count Rumford's plan, and a cut stone dome like an oven, erected above it; this is furnished with a steam-tight iron door, armed with a safety valve; in this dome two reels for winding up pieces of cloth are fixed, like common reels, to turn vertically. In the inside of the boiler two rollers are fixed, one near each reel; when a number of pieces of linen or cotton cloth are connected and wound upon one of these reels, an end of one is drawn under the rollers, and attached to the other reel, on which there is no cloth; when this reel is turned, it draws the cloth off the first, and so on the contrary. The cloth being freed from the dressing, in the common way, is immersed in alkaline caustic ley, wound upon one of the reels, passed under the rollers, and attached to the other reel; the boiler is then filled eighteen inches deep, with purified ley; this covers the rollers and that part of a piece extended under them. These rollers are so fixed that they can be unhooked at pleasure, and the cloth passed through the ley in the boiler, or through the steam only, as the operator chooses. The workmen continue to wind the cloth off-and-on those reels for two or three hours, about which time the colouring matter is sufficiently dissolved. It is then washed, immersed in the oxygenated muriate of lime, exposed three or four days on the grass, steeped in diluted sulphuric acid, and finished.

This method has been practised in manufactories of printed cottons, where it is necessary to bleach out the stain of madder, from every part of the piece, except that part where the figure is intended to remain.*

This process has been recommended for purifying linen and linen rags. These might be placed on frames, and exposed to the vapour of weak ley, the impurities with which they were charged would soon be dissolved, and by washing them in pure water, or in water slightly saponaceous, all the dirt would be removed, and complete whiteness obtained. This method is recommended to the managers of public hospitals; it would be attended with considerable saving, and completely destroy the power

of infectious vapours, which might have been condensed upon the clothes of the sick.

The common bleachers have long had a confused idea of the powerful effects of a high temperature of ley upon cloth, which they have attempted to produce by hasty boiling without a cover, not considering that the temperature is kept low by the vapour or steam carrying off the heat with it, which the steam-tight cover prevents; in every operation of this kind a safety valve, as in steam-engines, is absolutely necessary; while it prevents the temperature from rising too high, it effectually prevents accidents. What would be the expense and trouble attending an apparatus where twenty thousand pieces were bleached in nine months?

If the cloth is wetted with ley, might not pure water be substituted for the ley, in the bottom of the boiler, or might not the steam from the ley in the bottom of the boiler be sufficient?

A steam apparatus for boiling cloth, has long been in use in Messrs. Stevenson's green, at Springfield, near Belfast; there is a boiler similar to that used in steam-engines, with a safety, a feeding, and a damped valve. An iron tube is connected with the boiler from which two tubes proceed, and enter near the bottom of two iron vats; each of these tubes is divided into three branches, within each vat. The tubes are furnished with cocks, by which the steam may be stopped from entering any of the boilers at pleasure; near the mouth of each vat there is a flanch, on which a metal cover rests, at the time of boiling; this great cover is laid on and taken off by the same crane, by which the cloth is raised out of the vats after each operation. This apparatus might be regulated so as to produce any necessary degree of temperature, and might be easily applied to the eastern manner of bleaching, by steam. It is attended with many advantages, it is a security from the fracture of cast-iron boilers. The steam supplies the waste occasioned by the evaporation from boiling in the common way, and prevents any part of the cloth from drying in the boiler. It is a security against shot holes and other damages: it saves fuel and labour, and prevents the heat from escaping with the steam.

That a mixture of leys procured from mineral and vegetable alkalies is more effectual in dissolving the colouring matter than any of them separately, is an opinion generally received; wherefore, when our bleachers use pot-ash, they throw a bag of barilha ashes into the bottom of the boiler, not considering that the barilha contains charcoal, and that barilha and pot-ash are in a considerable degree caustic, and that hot leys in this state dissolve charcoal, which discolours the cloth, and requires a boil in pure caustic ley to extract it; every kind of ashes should be used in the form of ley, and ley should be purified from carbonic acid, with lime, and made with pure cold water. The degree of strength of these leys is determined by the taste; it would be more accurately done by a glass hydrometer, when immersed in vegetable alkaline ley; but as mineral alkalies contain neutral salts, in different proportions, this standard is uncertain. This aluminous test is most perfect.

The cloth being macerated in warm water, washed, and exposed on the grass for two days, it is boiled, washed, and laid on the grass for two days; then again boiled. It is thus alternately boiled, washed, and exposed on the grass, till fit for the sour. This method is now generally practised in Ulster.

SULPHURETS.

Mr. Kirwan's experiments on the colouring matter of linen-yarn on the alkaline substances used in bleaching, proved, that liver of sulphur is of all alkaline compounds the strongest solvent of the colouring matter. Ley of caustic pot-ash may be reduced to a solution of liver of sulphur, by adding to it, when boiling, one-twentieth of its weight of the alkali contained in it. The sulphur leaves a stain upon the cloth, which is very easily removed, by boiling it in pure alkaline caustic ley.

The high price of ashes in times of war, and the effects of lime upon sulphur, similar to those of alkalies upon it, suggested the idea of substituting the sulphuret of lime for sulphuret of pot-ash, in bleaching. Mr. Iliggin's experiments* confirmed this opini-

* Essay on the Theory and Practice of Bleaching.

on. The sulphuret of lime is made thus: Mix four pounds of powdered sulphur with twenty pounds of quick lime, pour gradually on them eight or nine times their weight of boiling water. The heat and ebullition occasioned by the union of the lime and the water is sufficient to form the sulphuret. When the ebullition ceases, the lime, which is not united to the sulphur, subsides; the mixture is to be well stirred and allowed to settle, the clear solution is then drawn off, and more water added to the deposite, till the whole of the solution amounts to sixty gallons. It may be prepared by boiling four pounds of sulphur in fine powder, and twenty pounds of lime, slacked and sifted, in sixteen gallons of water for half an hour; soon after the agitation of boiling is over, the insoluble matter falls to the bottom, the clear solution is drawn off; water is to be added from time to time to the undissolved deposite in the boiler, and taken off clear till the solution of sulphuret amounts to sixty gallons.

As quick-lime attracts moisture and carbonic acid with avidity, it is kept pure with great difficulty, wherefore a bleacher at a distance from lime kilns may preserve it, in the form of putty, and in making the sulphuret, he may take twenty-five pounds of it, and four pounds of powdered sulphur, and boil them half an hour in twenty gallons of water. The operation is to be pursued as above, till the solution amounts to sixty gallons. The cloth purged of the dressing, is steeped twelve hours in this solution, washed and exposed to the sun and air, and the same operations repeated, till fit for the boards and acid steeps; boiling in this solution has been tried, but with no better effect than cold steeping; boiling in alkaline caustic ley, hastens the process and dissolves the remaining sulphuret, which may have given a disagreeable tinge to the cloth. This method recommends itself by promising to save fuel, alkali, and soap.

LIME.

Steeping in a mixture of quick-lime and water, of the consistence of milk of lime, has been successfully tried. The cloth is put into it when brought to a scalding heat, to 200°, and macera-

ted without any additional heat, for twelve or fifteen hours ; it is then carefully washed, opened, and hanked, and again washed ; then exposed to the sun and air ; after three such manipulations, it is boiled in ley and grassed, till fit for sour and the boards ; severe laws against the use of lime in greens, in Ireland, have greatly retarded the progressive improvement in the art of bleaching.

Authors, on this subject, have not recommended the practice of bleaching with quick-lime, but have generally written with severity against it ; wherefore, the act prohibiting the use of it in bleach-yards is continued ; but no practice has been more warmly recommended by eminent authors than bleaching with leys purified, or made caustic with quick-lime.

The late Dr. Black, of Edinburgh, who received the first rudiments of his education in Belfast, demonstrated in a paper he published in the second volume of the Edinburgh Physical and Literary Essays, that the mildness of lime-stone, chalk, and marble, is owing to an elastic fluid contained in them, and that when this is expelled from them by fire, they are converted into quick-lime ; to this fluid he gave the name of fixed air ; the French school has given it the name of carbonic acid gas. He likewise demonstrated, that the same kind of fluid is the cause of the mildness of some alkalies, and when it is expelled from them by heat, or attracted from them by some substance which has a greater attraction for them, they become hot, more caustic to the taste, and their attractions for oils and resins is greatly increased. The attraction of quick-lime for this air is greater than the attraction of alkalies for it ; therefore, whenever quick-lime is mixed with alkalies in making ley, as for soap boiling, it attracts the air contained in the kelp, and leaves the ley caustic fit for making soap and bleaching.

Many prudent bleachers in this province, imitated the soap-boilers in making leys, fifty years past ; but the trustees, and several prudent bleachers, were prejudiced against it. But, in the year 1766, the late Dr. J. Ferguson, of Belfast, published an excellent experimental Essay upon the use of leys and sours in bleaching, in which he has greatly elucidated this subject. With the in-

tention of teaching bleachers to ascertain the quantity of carbonic acid fixed in ashes, and in lime-stone, and consequently of ascertaining the proportional quantity of lime; from different kinds of stone, which should be mixed with any quantity of the different kinds of ashes, and which would require all the gas contained in them, to restore the lime to a mild insoluble state. He ascertained the quantity of the gas in each kind of stone, and in each kind of alkali he had an opportunity of trying.* Dr. Black, with the like good intentions, published an explanation of the effects of lime upon alkaline salt, and pointed out a method whereby it may be used with safety and advantage in bleaching. His method and conclusions are, one half of kelp that is commonly used will be sufficient, when sharpened with lime; twenty pounds of dry slaked lime may be mixed with every hundred of kelp; the same is said of cashup or markoff ashes. Spanish kelp, or barilha ashes will bear one half of its weight of lime, and then one fourth of this kelp that is employed at present, will answer the purpose. Pearl-ashes will probably require double or treble their weight of lime, and will become so much the more active and powerful, that they may be diminished to one fifth or one sixth of their usual quantity. Dr. M'Bride, formerly of Ballymoney, late of Dublin, wrote, for the benefit of bleachers, an abstract of these two Essays last mentioned.†

So small a quantity of quick-lime is soluble in water, as a six-hundredth or seven-hundredth part of the water. Leys used in bleaching cannot dissolve even so much. No danger therefore can arise, from using much more lime than the quantity prescribed.

SOAP.

Two or three kinds of soap only, are used in Ulster. First, hard white soap made of kelp or barilha and tallow. Second, hard

* If then leys free from fixed air, be most effectual in bleaching, does not the advantage appear of mixing so much lime with our ashes as is sufficient to attract the whole of their fixed air, and thus to bring them to their highest degree of perfection.

† These, with Dr. Home's Experiments on Bleaching, were published in Dublin, in 1771.

yellow soap, composed of soda, tallow and rosin ; the rosin is added to render it cheaper ; it is not used by our bleachers ; the third is soft soap, made of pot-ash and fish-oil. It was long supposed that hard soap could not be made with pot-ash ; we now make hard soap with it, by throwing common salt into the boiler.

Chaptal laid open to the world his discovery of a process of making soap from old woolen rags, and the refuse of woolen manufactures. Sir John Dalrymple, by a similar method, made soap from the muscular and cartilaginous parts of fat fish.*

SOURS.

The first sours used were butter-milk and infusions of wheaten or rye-meal ; these are subject to three different stages of fermentation, the vinous, the acetous, and putrid. The acid continues to increase till the third commences, and with a rapidity proportioned to the temperature of the air. The period at which the putrid fermentation, which is hurtful to the fibrous texture, commences, is uncertain ; wherefore, the mineral acids which are not subject to such changes, and which retard and oppose putrefaction, are universally used in Ireland.

When alkali attracts the carbonic acid from fire or from the atmosphere, it is not perfectly neutralized by it, but if this gas is thrown into caustic'leys, it is attracted by part of the alkali with so much avidity, as to become perfectly saturated with it ; this part is then insoluble in water, as leys have an opportunity of uniting with the carbonic acid, when cloth is boiled in it ; this salt is precipitated on the fibrous texture, and prevents the farther action of the alkali upon the colouring matter. This obstruction is removed by some other acid which has a stronger attraction for the alkali than the carbonic, and which, when united with it, forms a compound salt, soluble in water ; this is the object desired in sours. Dr. Ferguson, when speaking of this salt, uses the language of Dr. Home, then common among chymists, and calls it an earth, because it was insoluble in water ; he clearly de-

* Both the above processes are given at large in the Phil. Mag. and Repository of Arts of London. EDITOR.

scribed its qualities, and the method of obtaining and dissolving it.*

Any of the mineral acids dissolve this salt, but that which is very antiseptic, at the same time effectual and cheap, is the acid of vitriol; so called, because it was obtained from green vitriol, commonly called copperas, by distillation in earthen retorts made of fire clay; the residuum is colcothar.

It was long obtained for medical purposes, by burning sulphur, under a bell-shaped glass; the coldness of the air condensed the vapour, which trickled down the glass, into a broad glass dish, placed below it. In a large work erected near Lisbon, in 1764, it was obtained by burning sulphur and a small quantity of nitre in large glass globes. These were expensive, and on a small scale; they gave place to great leaden chambers, in which the fumes of the burning sulphur are confined and condensed.

A quart of dephlegmated sulphuric acid, should weigh three pounds and three quarters; it is very seldom more than three pounds and a half. Ten naggins of such acid, are sufficient to make two hundred gallons of sour, of a proper strength for eighty pieces of yard-wide linen. I am assured that a quart of the sulphuric acid manufactured in Ulster, generally weighs more than three pounds eleven ounces, which the bleacher will consider when he measures the acid.

If the sour taste has been destroyed when the cloth has been six hours in the steep, too much of the acid has not been used. If the sour has been long delayed, a moderate quantity of it is insufficient to saturate the insoluble compound; but when sours are often repeated, and the same quantity of acid used, the part of the acid which is not saturated will act upon the fibrous texture and make it tender; each succeeding sour should be weaker.

The first sour should be tried with a hydrometer; if it loses its acidity by the salt attracted from the cloth, too much acid has

* It was proved in the thirteenth experiment, that some earth was precipitated from a ley, by its absorption of fixed air. As part, therefore, of the alkali becomes insoluble, it in part precludes the action of succeeding leys; it is necessary to take this earth out of the cloth, and this can only be done by the use of acids. *Experimental Essay.*

not been used ; sour a little stronger, which raising the hydrometer a little higher, may be fixed upon as a standard for other sours, after an equal number of boils in ley of the same strength. When sours are long deferred, the alkaline compound precipitated upon the cloth, precludes, in a great measure, the action of succeeding leys ; sours should be early applied, and they should not be again used till after some intervening boilings, and as heat increases the active power of solvents, the operation of sours applied warm, would be more expeditious and effectual. When linen is drawn out of the sour, it is washed, scalded in soap ley, soaped, rubbed, boiled, washed, and exposed on the grass. These manipulations are repeated, in Ulster, till a due degree of whiteness is acquired.

SMALTS.

In the last scald a small quantity of indigo is sometimes added ; but indigo reflects a tinge too dark. The well known blue of laundresses is preferred and generally used. This is made from a metallic ore, or oxide, called cobalt, found plentifully in Saxony ; when this ore is roasted, it is called zaffer ; when this is fused with three parts of sand, and one of pot-ash, the product is blue glass ; which, when pounded, sifted, and ground in mills, form smalts. That the blue may be obtained of various degrees of fineness, the smalts are agitated in casks filled with water, and pierced with openings at different heights. The azure brought by the water of the three different cocks, forms the different degrees of fineness, known by the names of azure of the first, second, and third fire ; the second cock sends out azure of a very good quality for mixing with starch.

Saxony and Bohemia were long exclusively possessed of smalt-works. By the exertions of Compté de Beust, the French had divided the trade with Saxony ; the Compté has found near the village of Juget, a quartz sufficiently charged with cobalt, which when fused for smalts, requires no additional quantity of the ore. Smalts are sometimes adulterated with hair-powder, which is easily detected by mixing them with water, the starch continues mixed with the water, the azure falls to the bottom.

When linen was starched, it was dried on the grass, or on hedges; but Mr. J. Nicholson, of Lawrence-town, on the Upper Bann, in the year 1727, demonstrated, that it was more conveniently and more perfectly done, in houses and lofts constructed for the purpose.

THE METHOD OF MANUFACTURING BLEACHING MATERIALS,
IN ULSTER.—BY DR. S. M. STEPHENSON, OF BELFAST.

From the Belfast Literary Society.

WHEN this great mechanical apparatus, (erections and engines for bleaching) is constructed at eligible falls of water, and placed in suitable houses, in one of which two boilers, with convenient racks and keives are set, the bleaching stuffs or materials are to be provided. The principal are fossil and vegetable alkali, lime, sulphur, soap, acids, pure air and manganese.

The fossil or mineral alkali, when purified and crystallized, is now called sal sodæ; it is called natron when found native, as in Egypt, Syria, and India, countries famous for the early manufacture of fine linen; this, or water impregnated with it, was probably, after pure water, the first bleaching material. Sal sodæ is procured in this country, [Ireland] from almost every kind of sea-weed, as fucus serratus, vesiculosus and nodosus. The last, the knotted fucus, which has long slender stalks, leaves small bulbs or vesicles in the middle of the stalk, vulgarly called eel-wrack, is most esteemed by our kelp-makers. In the months of June and July, these, and other sea-weeds, growing upon the stones and rocks of our shores, are cut with hooks; if the weather is very dry and warm, the wrack is laid upon the dry shore, in small heaps, and allowed to continue in them without stirring, till it is fit for burning; if the weather is cold and damp it is spread out to dry, and then gathered into heaps, in which it is allowed to lie till it grows regularly damp; it is then burned in kilns; these are built upon dry hard ground, with square stones, without cement; they are generally fourteen feet long, three feet

wide, and eighteen inches high. When the wrack is in a fit state for being burned, a fire is kindled in the bottom of the kiln; the wrack is slowly and regularly added till the kiln is filled with red hot ashes, which generally happens in six or eight hours. About this time bubbles are seen among these ashes; the kiln is then struck, the ashes are briskly stirred, or struck with small iron rakes till they assume the appearance of scorix of iron fusion, more weed is then added, and the same operation repeated till the kiln is entirely full. When cold, the walls are removed, and the kelp is broken into great square blocks for the market. Price, four or five guineas per ton in time of peace; it is dearer in time of war; at present about 15*l*. Men's wages for cutting and burning, 1*l*. 5*s*.; when it is made in distant islands, 1*l*. 12*s*. 6*d*.

Kelp was long esteemed an excellent bleaching material, but when farmers employed labourers to make it by the ton, they soon found, that sand thrown into the burning kiln increased the solidity of the kelp, and added to the weight. The greatest evil arises from the alkali fusing the sand, and forming a frit like that of which green glass bottles are made, which, though in some degree soluble in water, is not a good bleaching material.

The sal sodæ is found in ashes procured from various kinds of kali, especially from the *sal sola vermiculata frutescens foliis ovatis acutis carnosus* of Linnæus; named by French writers, *kali Hispanicum*, because the best is found in Spain, near Alicant, at some distance from the sea. This plant is cultivated, for this purpose, in different countries. It is found in the county of Antrim, at Carnelagh, near Glenarm. Soda is procured from *salicornea* and *chænopodia*. The sweet barilha from Alicant, is reckoned the best; but that which we import from Sicily contains the greatest quantity of the sal. sodæ, and is most esteemed by soap-boilers.

As mineral alkali is the basis of common salt, it may be decomposed after the method of Mr. Turner, in the manner he makes patent yellow; or of Mr. Kirwan,* by mixing boiling solutions of purified common salt, and of sugar of lead; in this

* Transactions of the Royal Irish Academy, vol. iii.

mixture there is an exchange of the acids. The acid of the sea-salt unites with the lead, and the acid of the sugar of lead unites with the mineral alkali of the salt; by evaporation large pellicles of acetous soda may be obtained; when this is heated in a crucible to redness, the acid inflames, the alkali remains in the crucible; in this process nothing is lost, for the lead may be revived, or turned into a pigment.

The vegetable alkali is obtained more or less by combustion from all vegetables; it remains in the ashes; it is the basis of salt petre, and of cream of tartar, and is easily obtained by mixing and burning these substances, in the proportion of equal parts, when pure. As this substance is of vast use in many experiments and manufactures, chymists have attempted to determine the quantity which may be procured from different kinds of trees and weeds. The French have determined that the greatest quantity is obtained from horse-chesnut; of weeds, fumatory and wormwood produce most. The vegetable alkali is known by different names, generally taken from the state of purity in which it is, or from the country from which it is sent. As Russia ashes, Dantzic pearl, Cashup, American pot, and American pearl.

The vegetable matter, as weeds, leaves, and branches of trees, are gathered before they seed, dried and burnt in an open fire; in countries abounding in wood it is burnt for culinary purposes. The ashes are carefully collected and kept dry, till they are lixiviated; this ley is poured off and evaporated in large iron pots, and the heat is continued and increased till the saline matter is melted; when cold, it assumes a great degree of solidity; it is then of a dark grey or brown colour, and is called potash; by the French chymists potasse; by some of ours, potassa; by the London college kali, when very pure, salt of wormwood. It is called pearl ashes from the blueish white colour it assumes when treated in the following manner: Potash is put into a reverberatory furnace, the extractive matter which the ley has dissolved, and which has united itself to the alkali is burnt off. In this process it is not allowed to melt, but it is constantly stirred, and consequently attracted from the fire carbonic acid to saturation, as much as is capable of attracting, that is, not less than thirty-seven



pounds in one hundred pounds of pearl ashes : adulterations of them with different kinds of salts, as sulphate of pot-ash, are detected by their not dissolving as pearl-ash, in their weight of water.

As none of these alkalies, even in their white and most beautiful appearance, are naturally perfectly pure, and as the alkaline part is that on which we principally depend for bleaching ; tests for discovering the materials, especially the alkali they contain, have been long the objects of the attention of chymists.

As alkaline substances are known to effervesce, when acids are dropped into solutions of them, it was supposed that the alkali was in proportion to the quantity of acid expended during the effervescence ; but as this effervescence arises from a fluid which is elastic, when not combined with another substance ; and as it is often combined with other substances, which are sometimes combined with alkalis, and as some very good ashes contain very little of this gas ; acids used as tests in this way are very uncertain.

As infusions of the blue or purple parts of vegetables, as of violets and leaves of red cabbages, are tests of the prevalence of acid or alkali in a mixture ; paper tinged with one or other of these, is used to determine when the acid and alkali of the mixture becomes neutral. If alkali prevails, the paper when dipped into the lixivium changes to green ; if acid, it changes to red : the proportional quantity of alkali, was found thus, in equal measures of ley made from equal quantities of different parcels. But as mineral alkali, when pure is capable of taking more acid to saturate it than vegetable alkali of the same degree of purity, this test is uncertain ; the former will saturate more acid than the latter, in the proportion of forty-eight to twenty-two, nearly ; wherefore if an acid test is used, attention must be paid to the kind of alkali tried, and calculations made agreeable to this proportion. The ashes which require most acid to saturate them are the strongest.

Mr. Kirwan has published, in the before cited paper, an account of an accurate test, consisting of solution of alum.

Alum is composed of sulphuric acid and pure  : both the mineral and vegetable alkalis take the acid from the clay  re-

precipitate it; but equal quantities of alkalis of different kinds, precipitate unequal quantities of earth of alum: one hundred parts by weight of mere vegetable alkali, precipitate seventy-eight of earth of alum; one hundred parts of mineral alkali, precipitate one hundred and seventy-one of the earth, nearly: nothing remains in the solution capable of dissolving this precipitate. The quantity of the earth of alum, taking into consideration the above qualities or the powers of the mineral and vegetable alkalis to neutralize these certain quantities of acid, and to precipitate these proportional quantities of alum, becomes a test of the quantity of mere alkali contained in any ley, except leys from mineral and vegetable alkalis mixed.

The method of making the aluminous test.—First, Take one pound of powdered alum, washed with cold water; pour on it three or four pounds of boiling water.

Secondly, Take an ounce of the substance to be tried, powder it, and put it into a Florence flask. If it is barilha or pot-ash, add one pound of pure water. If pearl-ash, or any alkali that contains little earthy matter, half a pound; boil for a quarter of an hour; when cool, filter it into another Florence flask.

Thirdly, Gradually pour the solution of alum, hot, into the alkaline solution, also heated, and a precipitation will immediately appear; shake and gradually add the solution of alum till the mixed liquor when clear, turns syrup of violets or paper tinged blue, with litmus or radishes, red; pour the liquor and precipitate on a paper-filter, the precipitate will remain on the filter; gradually pour on this, hot water, till it passes tasteless; when the precipitate is so well dried as not to stick to glass or iron, powder it in the cup in which it is dried; keep it for a quarter of an hour in a heat of from four hundred and seventy to five hundred.

Fourthly, Throw the earth thus dried into a Florence flask, and weigh it, then put about one ounce of spirit of salt into another flask, and place this in the same scale as the earth, and counterbalance both in the opposite scale; then pour the spirit of salt gradually into the flask that contains the earth; when all effervescence is over (if there is any) blow into the flask, and observe what weight must be added to the scale containing the flasks to

restore the equilibrium ; subtract this weight from that of the earth, the remainder is a weight exactly proportioned to the weight of mere alkali, of that particular species ; which is contained in one ounce of the substance examined ; or, if a pound is tried in a pound, all besides is superfluous matter.*

NEW, OR FRENCH METHOD OF BLEACHING.

So far as we are acquainted with the history of this art, mankind, in all ages, have employed as auxiliaries, the sun and free air ; how these operate is a question, for the solution of which we are indebted to the modern discoveries in chymistry.

The atmospheric air, for ages, was considered one of the four elements, but the celebrated Priestly discovered that it consists of several elastic gasses, different or opposite in their qualities ; the air we breathe, the atmospheric air, besides many elastic substances contained in it, consists of one-fourth of an elastic fluid, which when separated from other gasses in the atmosphere, supports combustion and animal life longer than common atmospheric air. This substance has obtained different names, from different chymists, which are most agreeable to the qualities they first discovered in it, or to the ideas they had conceived of it ; Priestley called it dephlogisticated air, because it had few of the qualities which air acquires on passing through fire. Scheele named it fire-air, from the power it has of supporting combustion. Lavoisier, air, eminently pure ; Condorcet, vital ; air, and Bergman, pure air.

As this elastic fluid has a power of forming combinations possessed of acidity, the name of oxygen is given to it, in the new nomenclature, from a Greek word, signifying sour or acid. In passing through fire and fermenting liquors, it combines with the substance of charcoal, (in the new nomenclature, carbon) ; it then forms an acid, the carbonic acid gas, which unites with lime and

* The precipitation of seventy-eight parts of earth of alum by vegetable alkali, denotes as much of this as the precipitation of 170.8 of that earth, by the mineral alkali. Kelps and pot-ashes, as they contain different sorts of alkali can only be compared together by means of the proportions above indicated.

alkalies, and renders them mild, and in a great degree inactive. Dr. Black separated it from many different substances, and first clearly described its principal qualities, and because it was fixed in some solids, named it fixed air, as has been particularly noticed.

Oxygen combines with the colouring matter of vegetables, reduced to carbon (charcoal) by alkalies, it assumes the elastic form of carbonic acid gas. The heat of the sun favours the combination, and by heating the ground, occasions a rarefaction of the adjoining air, causes it to ascend and give place to more distant, colder air; by this motion there is a constant successive application of oxygen to the colouring matter of flax. Dew is a powerful bleaching material, because water, especially in an elastic form, is capable of uniting with oxygen, and of giving it to the colouring matter.* Common herbage, consisting of a great variety of vegetables, give out pure air to it. If pure vital air in a more concentrated state, is applied to the colouring matter of flax, it will more speedily and perfectly hasten the process of bleaching; in this, the new, or French method consists.

The pure part of the atmosphere, oxygen gas, combines with metals, and forms oxides or calces of them. It combines with muriatic acid, and destroys its acid taste.

The combination of oxygen with manganese, on account of the abundance and cheapness of this ore, is of great importance; because, from it, oxygen gas is extracted and condensed for bleaching.

Manganese is brought to us in large, irregular, black fragments, resembling the ore of antimony, some brown spots are interspersed through it; the best is regularly crystallised in the form of small black, brilliant needles.

This substance has been long known to glass-makers, by the name of glass-soap, because when a small quantity of it is mixed with glass, in fusion, it removes the colour; when used in considerable quantity it changes the colour of the glass to purple or

* Berthollet exposed paper tinged with litmus, to dew, and found it so much saturated with pure air, that the colour was changed, and concluded, that the old prejudices in favour of May-dew were not without foundation.

garnet; when exposed to a red heat it emits pure air in considerable quantity; it is valuable in proportion to the quantity of this vital fluid which it contains.

This metallic oxide is largely diffused through the surface of our globe. It is found in quantities in Mendip-hills, near Bath;* it is finely ground in mills resembling these in which flint is ground for potters; in this operation it is often adulterated to one half the value; gentlemen who use much of this ore will purchase it in the gross, pound it, and powder it in mills attached to their own machinery.

When this oxide is digested in muriatic acid, a gas is disengaged of a yellow colour, and a peculiar suffocating odour. The acid loses its acidity by this combination; it has not a sour but a styp-tic, taste; it does not, as other acids, change the blue and purple of vegetables red, but destroys their colour.† It unites very sparingly with water.

To the ingenious and persevering experimental Swedish apothecary, Scheele, we are indebted for these discoveries, which he published in the Stockholm Transactions for 1774. This ore, powdered, was put into a retort, immersed into a sand heat, and muriatic acid added to it; in fifteen minutes the receiver was filled with yellow vapour, which had the qualities now mentioned. By it the flowers, and even the green part of vegetables were rendered pale and colourless. The liquor left in the receiver was changed into weak spirit of salt. His theory is, that a part of the acid dissolves the oxide; that from the solution pure air is expelled, which unites with that part of the acid, unconnected with the metal, and as pure air had gotten the name of dephlogisticated air, Scheele named this vapour dephlogisticated muriatic acid. The French chymists conceiving pure air, an acidifying principle, named it oxygen, and when this was united to muriatic acid they called the compound oxygenated muriatic acid, which was afterwards contracted into oxymuriatic acid.

* And in various parts of Virginia and Nova-Scotja. EDIT.

† If pure air contains the principle of acidity, how does it supersede the principal qualities of the muriatic acid, when united with it?

Immediately after this great discovery, the French chymists turned their attention to a substance which exhibits such singular properties.

Chaptal exposed old prints to the influence of this substance, from which they acquired a degree of whiteness they never before possessed; as he used it much diluted, it had no effect upon the printer's ink.*

Berthollet of Paris prosecuted this subject, and published an account of his investigations in the Transactions of the Academy, in 1785, and in the Physical Journal 1785 and 1786, and in the year 1786 he published the result of his inquiries and experiments in the second volume of the *Annales de Chimie*. This interesting paper has been translated into English, and published in Dublin for the benefit and improvement in the art of bleaching.

Before he attempted a complete investigation of the properties of this unknown noxious elastic vapour, he supposed uniting it to water, a necessary precaution. This he attempted to effect, by agitating this gas in a phial with water, supposing it would unite with it, as fixed air, carbonic acid gas, does; but the suffocating vapour which was exhaled, induced him to choose Woulfe's apparatus for his future experiments, of which there is a cut in the *Annales de Chimie*, Vol. II.

By this apparatus he forced the vapour to the bottom of the water in the first receiver, called an intermediate body, which attracted from it the uncombined muriatic acid; the oxygenated muriatic vapour ascended to the top of the water in the intermediate body, passed into another bent glass tube, which connected the first and second glass bodies, and there the vapour connected itself with the pure water; he found when the second glass body, containing diluted oxygenated muriatic acid was exposed to the rays of the sun, a profusion of bubbles arose to the top, which consisted of pure air, and that when all was disengaged, the glass body contained pure air and water slightly impregnated with muriatic acid; hence he concluded that oxygenated muriatic acid was nothing more than a combination of the muriatic acid, with the pure air or oxygen, extracted from the black oxide of manganese.

* This process is very neatly performed by Mr. Rasch, of Philad. Ed.

He tried to bleach thread and cloth with this liquor concentrated, he made them white and tender; then he tried it weak, he made them white, but by keeping or immersing them in ley they turned yellow; he then used the blanching liquid and ley alternately; lastly, he steeped in diluted acid of vitriol, and obtained a perfect white.

Mr. Welter constructed a simple and extensive apparatus for preparing the blanching liquid, on a large scale; this consisted of a small portable furnace, which contained a retort or a bolt-head, in which, and in an intermediate glass body, a bent glass tube was fixed. In this intermediate body there was a safety tube, and a tube for conducting the blanching vapour into a wooden receiver, ~~ready~~ full of water, and well closed, in which there was an agitator turned with a crank horizontally; when the water was impregnated with the vapour, it was drawn off for use.*

The expense of using muriatic acid was so great that no manufacture could bear it, wherefore M. Berthollet conceived that muriatic acid could be extracted from common salt, by the acid of vitriol, and the pure air from manganese by the same process. Wherefore he took of powder of oxide of manganese, six ounces; of marine salt, one pound; of sulphuric acid, and of water, each twelve ounces. It is necessary to augment or diminish the quantity of manganese in proportion to the qualities of the oxide.

Immediately after the publication of Berthollet's Treatise, the new method was tried on the river Clarey. The workmen fell into the same mistake as the French in their first essays; they imagined they should produce an elegant white without any material but oxygenated muriatic acid. It did whiten the colouring matter to a certain degree, to half white, but no manipulations in the same liquid could whiten it better; when dipped in ley, it was changed to a dirty yellow. It required as many operations in the Irish method of bleaching, as if it had never been dipped in the blanching liquid.

The French chymists tried immersion in the liquid, and in caustic ley alternately; when the ley was brought to the boiling

* Annales de Chimie, vol. II. p. 163.

point they succeeded. The manipulations were always finished with a sour.

To prevent accidents which might result from too great strength of the liquor, a test for ascertaining the bleaching power of it, was founded by M. Decroisille; he took one part of indigo, reduced to fine powder, and eight parts of concentrated sulphuric acid (if the acid is much dephlegmated, seven parts will be sufficient) he digested this mixture in a matrass some hours, in a hot water bath; when the solution was finished he added water till the whole amounted to one thousand times the weight of the indigo used. Mr. James Watt, of Birmingham, found a good test in infusion or decoction of cochineal.

Before this test-liquor is used, the bleacher has provided a test-tube of glass, about twelve inches long, one inch or seven-tenths wide, funnel-shaped at the mouth, with a stand like a wine glass. If a tube could be found perfectly cylindrical, a scale equally divided might be cut upon it; but as this is next to impossible without boring or grinding, it may be divided mechanically, by putting into the tube, one hundred parts, suppose grains of rain or distilled water; the surface will show the place of the first cross line upon the tube, which may be marked 0; the part of the tube, although cylindrical, occupied by the hundred parts of water, is called the bulb. The scale is finished by adding from time to time twenty grains of water, and marking the surface of each for a degree.

The bulb of the tube is filled with the test-liquor; the blanching liquid, diluted as near as may be to the degree requisite for a steep, is added cautiously, till the mixture rises in the tube to one degree, then it is well shaken. This is repeated till the mixture is changed from blue to brown. The degree on the tube, at which the mixture rests, denotes the blanching power of the liquid. If it rests at one, it is the strongest, because least of the liquid blanches the test. If the colour is not destroyed till the mixture rises to the second degree, it is half the strength, and is then sufficiently diluted for the first immersion of coarse cloth. Each succeeding steep should be weaker.

Mr. Rupp, of Manchester, has improved the test-liquor, by adding acetite of lead (sugar of lead) to the solution till the lead is precipitated, and the indigo is united to the acetous acid.*

The use of the test consists not only in ascertaining the strength or the bleaching power of the liquid, but in determining the additional quantity which should be added, to the ley remaining in the kieve, after the cloth is drawn, that it may be of the same strength as at first. If the first steep is of such strength as to require so much of it put into the tube, as shall raise the mixture to three on the scale, and, if, after the immersion so much must be added as to raise it to six, then half as much of the strong liquor first used must be added to bring it to the same strength as at first. The second steep of the same cloth should be so much weaker that the surface of the mixture in the tube may coincide with number four on the scale.

In order to determine whether bleached goods have been injured by the bleaching process; the manufacturers of thread and cotton hose, adopted the practice of running a line of vat-blue dyed very dark, or of Turkey-red, along the top of each stocking, and those bleachers only were employed who could render the hose perfectly white without effacing the blue or red stripes, or even lessening their intensity of colour. The hyper-oxy-muriate of lime will destroy indigo-blue or Turkey-red, if used of its full strength, and yet it may be so diluted as not to injure these colours, and will still be strong enough to bleach brown linens or cottons. The same practice has been advised to be adopted with respect to other kinds of linen and cotton goods. But a writer in a foreign publication, who styles himself a "Bleacher," objects to the test proposed, and says, "that he will bleach goods with both red and blue preserved, and the cloth will be rotten, though the colour be good; for instance, very often the bleacher, in the last finish, lets them lie in sulphuric acid water, tasting sour, then he rinses them out of that well, and dries them; now if they should

* The test with vitriol is inadmissible, in experiments upon the comparative strength of the bleaching liquor, with and without alkali, because sulphuric acid decomposes the muriate of potash.

not be properly washed, as I have seen, and dried with part of the acid in, it corrodes the cloth, &c. through time, and the red and blue stand the sulphuric acid well. Oxygen is a great enemy to vegetable colours, but being saturated either by alkali or lime, it in part preserves the colours, though it still acts on the brown colour of the cloth; but to bleach red and blue requires very great care to know what hurts them most, and to avoid it: for boiling with strong pot-ash reduces the blue very much, and many weak immersions to save these colours are expensive, and the bleacher can neither do them so soon or so cheap; likewise some dyer's blue and red will stand as well again as others; and for the heavy goods, as they have about Manchester, it would be almost impossible to bleach them without destroying these two colours, even out in the air; but goods that have been wove with half bleached cotton, the process is less, and they can be easier preserved. The same strength of oxygenated muriatic acid, that would take out the red and blue, by adding pearl-ash, will preserve it; but though the oxygenated muriate of lime was used as strong again as that which takes out these colours, it would not injure the cloth by proper management; the chief thing is to have the liquor settled well, and the goods lying no longer than necessary, and to *rinse well* before putting them into the sulphuric acid water; they should be boiled for the finish, out of pearl-ashes and white soap, and then rinsed and dried; for the boiling with the alkali destroys all the muriatic acid it might have imbibed. Weak alkali does not injure cotton, but I have seen in the beginning of the new process of bleaching, goods, that have not been rinsed and boiled out of the oxygenated muriatic acid, so rotten as hardly to hang upon hooks, beautiful Manchester marcellas, and dimity, owing to the ignorance of the bleacher in using it. The only way, in my opinion, which is the way that I do, is to take a piece of the end of the cloth between my two thumbs and two fore fingers, and let the nails of the thumbs press together, so as to have a purchase or power upon the cloth, and you may judge from that of the strength of the cloth, likewise you may judge by tearing it both by warp and weft, take notice how it tears, either with noise or otherwise; by attention to this, I

think the buyer might easily distinguish goods that are sound from those that are not; but to trust to colours is an uncertainty, for there is cotton yarn so rotten, that it can hardly be woven, and sometimes even the webs remain so long with the weaver's dress in them, and upon damp places, that they come to the bleacher half rotten before he begins upon them; but in my opinion the buyer should try the strength, which he will soon learn to know, by the above method, and that is the surest way."

The principal objection to the use of bleaching liquid, is the suffocating vapour rising from it in every operation. The last was successfully tried by making the kieve in which the cloth was to be steeped, partly filled with water, the receiver of the vapour; and having the cloth wound round reels in it; the agitation produced by the motion of the reels and of the cloth, is sufficient to produce a perfect mixture of the gas with the water, and with the colouring matter of the cloth.

Mr. Rupp has recommended the use of oxygenated muriatic acid in water alone, and has published an account of his experiments and apparatus in the fifth volume of the *Memoirs of the Society of Manchester*. This consists of an oblong deal cistern, in which two perpendicular axis are placed; a number of pieces of cotton connected together are wound upon one of them, the cistern is covered with a steam-tight lid, the liquor put into it, and the pieces wound from one axis to the other, till the liquor is exhausted.

As ley of potash absorbs the gas with great avidity, and retains it more obstinately than pure water, it is less dangerous to the workmen, and cloths may be wrought in it without danger, in open vessels; it is very much in use in cotton factories.

This lixivium is more expensive and less effectual than the oxygenated acid, mixed with water alone; because part of the acid forms with the alkali a salt known by the name of oxygenated muriate of potash, which is useless in bleaching, as it does not destroy colours*. When so much of the gas is thrown into the ley of potash as to destroy the bleaching power altogether, it is called hyper-oxy-muriate of potash.

* Berthollet's *Memoires de l'Acad. de Turin*.

The apparatus used in Ulster consists of a cast metal boiler, which contains water for a hot bath; a leaden pot with a close cover, called a still, instead of a glass retort is inserted in it. In this cover is a tube, through which an iron rod passes, which can be turned at the top; arms are fixed in it for agitating the contents of the still, all covered with lead. Near the boiler a leaden vessel called an intermediate body, partly filled with water, is placed. From the cover of the still, a leaden pipe issues, and turns into the cover of the intermediate body; from the cover of the intermediate body, another tube issues and turns into the cover of a large wooden cask, which contains water, or ley of potash, and is called a receiver; in this there is an agitator similar to that in the still; equal parts of common salt and manganese are put into the still, the cover is put on, and luted. Sulphuric acid equal in weight to the salt used, is diluted with its bulk of water, and poured through a bent leaden funnel, upon the other ingredients. The sulphuric acid unites with the alkali of the salt, the acid of it acts upon the manganese and expels pure air from it, which unites with that part of the muriatic acid vapour, unconnected with the manganese, and oxydises it. This vapour rushes through the bent tube into water in the intermediate body, which attracts the pure oxy-muriatic vapour, rushes into the ley and combines with it. The water in the intermediate reservoir arrests the portion of the muriatic acid gas, which escapes at the commencement of the operation, without being oxygenated, and also any sulphuric acid which might have chanced to pass.

In making the oxy-muriate of lime, an intermediate body is unnecessary; the only agitator is a wooden rake, the shaft of which moves in a tube, in the side of the receiver. Four pounds of salt, four pounds of manganese, and four pounds of sulphuric acid diluted with equal its bulk of water, will produce a sufficient quantity of oxygenated muriatic vapour, for one hundred quarts of ley, made with one pound of ashes.

The amount of alkalies annually imported into Ireland, in times of peace, is 215,307* It is greater in times of war. The

* Higgins.

price of ashes, and the similarity of the qualities of lime and potash, suggested the possibility of uniting oxygenated muriatic acid with lime, in a fluid state; this method was first thought of in Ireland.*

Gas from thirty pounds of black oxide of manganese, thirty pounds of salt, and thirty pounds of sulphuric acid diluted with its bulk of water, was thrown into a mixture of sixty pounds of lime, suspended in one hundred and forty gallons of water. For this, Mr. Tenant, of Glasgow, claimed a patent; but it appeared he was not the original inventor. He then united the vapour with dry lime and obtained a patent for it, still in force.

Oxy-muriate of potash as it comes from the manufacturer, is diluted with thirty-five or forty waters before linen cloth is steeped in it. One pound of oxy-muriate of lime, in a dry state, is soluble in three gallons of water. It is necessary to add twenty-five gallons to this solution, before coarse linen is immersed in it, and more water if for fine cloth. As this is more effectual and more severe than oxy-muriate of potash, greater attention to the steep is requisite.

One large vat of fir is sufficient for the mixture of oxy-muriate of potash and steeping cloth; two vessels such as wine pipes are required for the operations of oxy-muriate of lime; one for dissolving the salt, the other for reducing it.

When either of the leys is thus prepared, cloth is loosely thrown into it and steeped from six to twelve hours. That it may be perfectly purged from the oxy-muriate; it is then well mill-washed, scoured, and scalded in solution of soap, washed, and exposed to the sun and air; it is then starched and finished. The cloth is generally so much bleached in the common way, by frequent boils in alkaline ley, that one steep is sufficient; if more is necessary, boiling in ley and exposure to the air are repeated, previous to each steep.

The French boil in ley, made in the proportion of one pound of pearl ash or potash, made caustic with lime, diluted with twenty quarts of water. It is washed and steeped three or four hours in the blanching liquid; these operations are alternately

* O'Reilly, Phil. Mag. vol. 10. p. 302.

repeated six or eight times, the cloth is then sufficiently prepared for the sour.*

Cloth, when it can be done, is subjected dry to every boil and every steep. The leys then penetrate the fibrous texture of the thread, are attached to the colouring matter, and dissolve it, and are washed away by pure water, or whitened by pure air; or, according to O'Reilly, reduced to carbon by alkali; the carbon united to the pure air of the atmosphere, or of oxy-muriates, becomes volatile, and escapes in the form of carbonic acid gas. When cloth is immersed wet, the bleaching leys should be stronger. But if cloth is submitted dry to the action of steam in a high temperature, it may be made tender, or dissolved by it.

Some adventurers from England and Scotland, pretending to great skill in the art, and to the knowledge of important secrets in it, came into Ulster, and offered their services, for which they claimed great rewards; whoever practised their schemes upon a larger scale, was greatly injured, the cloth was tender, it mildewed; our manufacture and the new method of bleaching was brought into disrepute by their practice.

Inattention to the strength of the liquid, to the operations of washing, scouring, and scalding after steeping in it, was the cause of these misfortunes. If cloth is exposed on the field, in the stormy months, it will be tossed and often torn; when the days are short and dark, very little benefit is derived from the atmospheric air, it is then subjected to the alternate severe action of leys and mills.

In the summer months the selvages often escape the action of the pure air, and are insufficiently whitened. The black specks formerly described, called firing on flax, and sprit in cloth, adheres to the fibrous texture, through the different manipulations to which flax and cloth are subjected, even till every other part of the thread is perfectly white. In all such cases, the new bleaching liquid, managed with caution, would instantly remove these evils, and preserve the fabric from more severe operations.

* Berthollet, in the second and sixth volumes of *Annales de Chimie*, and in the *Art of Bleaching*, by Pajot de Charmes.

Bleaching with oxy-muriates has been tried in paper manufactories. The rags of which the paper is to be made, or else the pulp into which they are reduced, are submitted to their action. This method has been generally relinquished, because paper improved by it in colour, has, in a very few years, impaired the colour of the ink; even printers' ink has been known to fade by the action of the oxy-muriates remaining in it.* These detergents act upon the iron of the cylinder, and occasion iron-moulds. Washing with profusion of pure water in the engine, would remove the remainder of the bleaching liquid, but this would be attended with more trouble and expence than the old method. If paper manufacturers will imitate the method of bleaching described, they will be successful.

Let them attach a small wash-mill, on the plan of the old tuck-mills, to their machinery; washing with the cylinder is only rinsing. When the rags are sorted, let them be steeped in kelp or barilha ley, for twelve hours; wrung or pressed and washed, again wrung and wetted with ley, then laid two inches thick upon frames in a steam apparatus, and submitted to the vapour of the ley in which they were first steeped, at the temperature of 250° . This process relaxes and opens the fibrous texture of the threads, and the water in the mill entering them carries off the dirt and colouring matter. If the most beautiful whiteness is required, immerse them in oxy-muriate ley, wash and immerse in acidulous water, wash and beat them into pulp. If the rags are so small that they may be in danger of being lost in the mill, they may be confined in coarse nets. Refuse of tow from flax-mills or hackles, may be prepared for fine paper by a similar process.

Oxy-muriates must be used in discharging the colour from coloured rags, and ink from written paper; even printed paper has been bleached by the alternate use of the alkaline ley and the blanching liquid; for this purpose, I recommend an engine resembling the engines in use, but with a cylinder of wood. The axis may be of wood, or of glass run upon lead, and secured with leather collars. The case provided with a steam-tight cover. The

* Murray's System of Chemistry, vol. 2. p. 565.

rags when beaten into pulp with the steel roller, are to be run into the wooden engine, into which the oxy-muriatic vapour is to be forced from a small apparatus for the purpose. The motion may be given to the wooden cylinder by hand, which will sufficiently agitate the water and the pulp, so as to expose different surfaces to the action of the vapour. The pulp may then be allowed to subside, the water run off and acidulous water run in, agitated and washed as before. The pulp will then be freed from every thing injurious to the paper. If an apparatus for preparing the oxygenated muriatic acid is inconvenient, the bleaching salt and oxy-muriate of pot-ash can be procured from the vitriol manufacturers at a lower rate than private individuals can prepare them for their own use.

In bleaching cloth, rags, or pulp, with oxy-muriate of pot-ash, the stuffs must be made to pass through acidulous water, that the sulphuric acid may expel the oxy-muriate from its combinations. The alum used in the size for writing paper, will in some measure have this effect. The small quantity of alumine, or of a selenitic compound precipitated, will not have a bad effect on the paper. When oxygenated muriatic acid combined only with pure water is used, washing well, and exposure to the air and light may be sufficient.

This method points out the means of preparing expeditiously and economically, the coarsest tow, the brownest and the dirtiest rags and cloth, being made into the best and whitest pulp for paper.

NOTE.—For additional remarks on bleaching, and the process by which it is conducted at Manchester, see Domestic Encyclopedia. ED-

EXPERIMENT OF ROTTING HEMP,

AGREEABLY TO MR. BRAALLE'S METHOD.

IN the first number of the ARCHIVES, mention was made of a public experiment by M. de Liancourt, of rotting hemp, agreeably to the process of Mr. Braalle: the following account of the experiment is given by himself in a French Journal—*Annales de l'Agriculture Française*, tome xxii. p. 289.

The government, in diffusing through the departments, instructions to rot hemp in two hours, by Mr. Braalle of Amiens, and in all seasons, invited proprietors to repeat those experiments, the success of which he had ascertained, by repeated trials during four months, as one of the commissioners named by the government.

M. de Liancourt thought it his duty to attend to this benevolent call: the success of the method of Mr. Braalle, was of great importance to the country in which he lived, (Liancourt, department of Oise) where hemp is extensively cultivated, and where consequently, the rivers, brooks, and marshes were infected during two months of the year, and obstructed during the remainder, by the common method of rotting hemp, and where the women upon whom this task falls, (and they are almost all so employed) are subject from that work to accidents, and to frequent diseases, which bring on premature old age.

But however well convinced M. de Liancourt might be of the excellence of this method, attested by the report of the commission, it was necessary to convince those of its superiority, for whose benefit it was principally designed, and who attend with great reluctance to every project that is new to them, chiefly in rural matters, in which the usual methods are always, in their opinion, the best, and which they think cannot be changed for the better, without the imputation of insanity.

It was necessary, moreover, in making the experiment before the country people, to show to them its easy practicability, its cheapness, and the simple apparatus it required.

M. Molard, who had been one of the members of the commission, charged with the experiment of Mr. Braalle's method, was consulted; this friend to arts and the public welfare, was not contented with giving his advice by letters, but wished to come and preside at the essays of Mr. Liancourt: he did more, he brought to Liancourt, Mr. Braalle himself, the author of the discovery.

All the women of the district were invited to witness the experiment; the judge, and the mayor were also invited. It was necessary to give to the success of the experiment, all the authenticity which circumstances would admit of, and which could only produce the desirable conviction,—a conviction indispensably necessary to produce in that country all the good which was designed.

Here follows the process :

A farm kitchen was the laboratory: the common kitchen boiler was filled with $107\frac{3}{4}$ kilogrammes, (220 lbs. French) weight of water, in which 48 grammes (12 oz. French) of green soap were dissolved: ten kilogrammes and three-quarters, (22 lbs. French) of hemp were to be rotted. The imperfection of the apparatus, and the uncertainty of the quantity of soap, inclined Mr. Braalle to think it was proper to increase the soap a little more than usual; when the water had attained the 80th degree of Reaumer's thermometer, it was poured out into a bad bathing tub, in which the hemp was laid horizontally and pressed with stones, in order to effect the entire immersion; the bathing tub was covered with planks and linen cloths, to confine the heat, and prevent evaporation as far as the imperfect apparatus would permit.

Two hours afterwards the hemp was taken out of the tub; and some handfuls distributed among the women; they examined it while very hot, and found it so perfectly rotten, that they could peel it with the greatest ease. The rest of the hemp was put to dry and covered with nets.

The experiment was renewed immediately on the same quantity of hemp; the soapy liquor left in the tub was again returned to the boiler, and three buckets of fresh water, thirty-six gram-

mes (9 oz. French) of soap were added, and they proceeded with the same success as at the first trial.

This was not enough : the hemp might be apparently well rotted, but it might be said to be less fit for domestic purposes than the hemp rotted agreeably to the old method, if the objection had not been anticipated by the proprietor, in proposing to submit the hemp so rotted to the subsequent operations, such as drying, breaking, combing, spinning and weaving; and to convince all the witnesses of those successive operations, even by their participating in the work, if they chose. The hemp dried and cool under the nets was spread on billets of wood, and lightly broken by a stone roller. It was then spread on the grass to be whitened, but by the carelessness of the men charged with that operation the complete success was checked; the hemp ought to be put on grass, exposed in the pure air, and to the sun, but it was placed near a stack of oats between two buildings, and on grass too often frequented by fowls : it could not therefore whiten completely. Some parts entrusted to country women, and exposed in a good place, whitened perfectly. The other operations which the hemp had to undergo, succeeded intirely, and it was acknowledged at the combing, that it gave less shaws than the hemp rotted in the common way; that the shaw itself was stronger than the heart of the common hemp; and that the filaments of the heart of the hemp were incomparably finer, straighter, stronger, and less twisted than those of the heart rotted according to the old method.

The superiority of the thread extracted from this hemp, ought to be, and was in reality the consequence of that operation : every woman who spun it, and there were upwards of thirty undertook to do so, found the thread more easily spun, and acknowledged that it was stronger than the common thread : the thread of the shaws itself, was acknowledge to be equal in quality to the thread of the heart of the common hemp.

The operation of peeling was attended with the same success : and it was also acknowledged that both the cloth of the shaws, and that made from the heart of the hemp, woven by the same person, without any additional care, were superior to that made with thread from the shaws and heart of hemp rotted according

to the old method, and consequently there is no doubt, that the hemp rotted agreeably to the new method, (quantity being equal) will produce a greater proportion of cloth, than hemp rotted in the old mode, because the filaments are straighter, stronger, more pliable, and the proportion of shaws is considerably less.

Besides the advantages already mentioned* of the new process, M. de Liancourt adds, that it preserves the filaments of the hemp in all their strength, and renders the operation of rotting more certain; since every inhabitant of the country knows that in the old way, if the hemp be left in the water twelve hours longer than necessary, it very often takes on a putrefactive ferment, and that the rains, or farm work, more immediately pressing, often causes such a delay.

Another consideration of national importance, is the facility that the new method of rotting gives, of cultivating hemp in all soils capable of producing it, whereas at present, the culture of hemp is confined to soils in the vicinity of water. Besides it happens very often, that in very hot summers the waters of the marshes and creeks which are used for rotting hemp, are exhausted, and the farmers who have grown hemp are obliged to carry it to water in remote places, sometimes three and six miles, which causes a great loss of time and extra expense in the hire of hands, for the apparatus for preparing it, and for the permission to use the water.

MISCELLANEOUS OBSERVATIONS ON SHEEP.

ADDITIONAL weights of fleeces of long woolled sheep in Virginia: also of Mr. Livingston's flock: correction of errors respecting it in the first number of this work.—Woolliness of Merinos' legs.—Utility of salving sheep.—Account of sales of Merino sheep in Philadelphia.

IN the first number of the ARCHIVES, p. 70, 73 and 124, the weights of several fleeces of American sheep were given, in order to show the capability of improvement in our flocks, and the

* See also, Archives, No. 1, p. 64.

improvement which had actually taken place in certain districts. The following additional facts will serve as further encouragement to improvers.

In May 1809, Mr. Alexander Stuart, of Beverly, Somerset county, Eastern Shore, Maryland, sheared five sheep, the weights of whose fleeces were as follows. They were the lambs of the preceding year.

No. 1.	10 $\frac{1}{2}$ lbs.
— 2.	9 "
— 3.	8 $\frac{1}{2}$ "
— 4.	8 $\frac{1}{2}$ "
— 5.	8 "
<hr/>	
	43 $\frac{1}{2}$ lbs.

At the sheep shearing of Mr. Custis, of Arlington, Virginia, in April 1809, the following sheep were shorn.

Columbus, a tup lamb, by Mr. William Fitzhugh, of Ravensworth, Virginia; weight on hoof 130 $\frac{1}{2}$ lbs.—weight of fleece washed, 5 lbs. 5 oz.

Horn Took, a tup lamb, by Dr. Wm. A. Dangerfield, of Notley Hall, Maryland, weight on hoof 132 lbs.—weight of fleece, unwashed, 8 lbs. 9 oz.

Palafox, a tup lamb, by J. Scott, Esq. of Strawberry Hill, Virginia, weight on hoof 163 lbs.—wool, unwashed, but very cleanly kept, 5 lbs. 13 oz.

Two ewes, by W. H. Foote, Esq. of Hayfield, Virg., weight of one on hoof, 91 $\frac{1}{2}$ lbs.—fleece, unwashed, 7 lbs. 3 $\frac{1}{2}$ oz.—of the other, on hoof, 92 lbs.—fleece unwashed, 6 lbs. 14 oz.

In page 91, of the ARCHIVES, No. 1, I stated on the authority of a gentleman who had lately been at Mr. Livingston's, that the Merino tup, Rambouillet, weighed at the last shearing (1810), 155 lbs. Mr. Livingston informs me, this is a mistake; he only weighed 145 lbs.; it was another ram, Clermont, that weighed 155 lbs., with his fleece. Thus, at two years old, he was heavier than his sire, a first rate imported Rambouillet ram. It is to be understood, also, that the weights of Clermont and the other two

rams, in 1809, (as stated in p. 91 of the ARCHIVES, No. 1, from Mr. L's book,) were taken after being shorn. Another of Mr. Livingston's stock rams, Jasqn, a shearling, in the presence of two hundred witnesses, yielded the present season, a fleece of 11 lbs. 12 oz. This, as justly remarked by Mr. Livingston, "is extremely satisfactory, since it shows we have already brought in this country, the Merino sheep to as great perfection, as they have attained in Britain. Mr. Tollet's heaviest ram's fleece being exactly the same with mine."

I have also stated, page 89, the average weights of the ewes' fleeces of Mr. L's flock, at from 4 to 5 lbs.; this however only referred to the half and three-quarter bloods; the average of twenty-seven, $\frac{7}{8}$ bred ewes, and of seven full bred ewes, which was 5 lbs. 2 oz. was overlooked. Mr. Livingston informs me, the lightest ewe fleece weighed 3 lbs. 7 oz., and the heaviest 8 lbs. 12 oz. The average of fleeces of his full bred ewes, lambs included, was 5 lbs. 13 oz.; that of all his ewes to the number of more than two hundred, half bred included, was upwards of 5 lbs. 2 oz.; a weight which he considers, and very justly, as a noble yield, and very encouraging to those who seek for quantity as well as quality of wool, and especially when it is considered, that nine tenths of the ewes had lambs.

Mr. Livingston adds,

"Having given the general average of my ewe flocks, permit me now to present you with a view of some selected ones, not kept up to be shorn, but running with my flock, and having lambs at their sides. The greatest number you have exhibited, (in the ARCHIVES, No. 1,) from one flock, is eight long woolled ewes from Col. Tayloe. These are indeed fine sheep; but still inferior even in quantity of wool, to the same number of Clermont Merinos. Eight of his ewes gave $62\frac{1}{2}$ lbs. of wool. All mine were weighed, and booked in the presence of two hundred witnesses; the wool in the yoke, but free from tags, and the sheep as clean as it was possible for unwashed Merinos to be, having been littered all winter, and kept in clean grass grounds at all other times, and having been besides washed by the heavy rains which fell every day for a fortnight together, till five or six days

before they were shorn. The weights of eight of mine under these circumstances were as follows :

No. 1. weighed	-	-	-	-	8 lbs. 12 oz.
— 2. „	-	-	-	-	8 — 6 —
— 3. „	-	-	-	-	8 — 4 —
— 4. „	-	-	-	-	8 —
— 5. „	-	-	-	-	8 —
— 6. „	-	-	-	-	7 — 14 —
— 7. „	-	-	-	-	7 — 14 —
— 8. „	-	-	-	-	7 — 12 —

64 lbs. 14 oz.

Average 8 lbs. 1 oz. 15 pwt.

The average of twenty-four selected from Col. Tayloe's flock was a little better than 5 lbs. The average of all my full bred ewes taken collectively, was 5 lbs. 13 oz. ; and that of my whole flock, of upwards of two hundred ewes, exceeded by some ounces Col. Taloe's twenty-four. The average of half my flock, including the four rams, was 7 lbs. 10 oz.—this average struck upon upwards of one hundred sheep. The average of one third of my full bred and seven-eight bred ewes, was 7 lbs. 3 oz. 12 pwt. The average upon one third of my three-quarter ewes only, 6 lbs. 11 oz. 12 pwt. It is obvious then, that if I were now to part with half my ewes, retaining only the best, that my fleeces would be as heavy as Mr. Tollet's celebrated flock of full bred Merinos ; and that if I was to cull out of my present number, seventy of the best ewes, that their fleece would average seven pounds, which, considering the difference in the degree of cleanliness between mine and the sheep at Rambouillet, would bring them very near to a par : for Mr. Lasteyrie says, they had not yet attained collectively to 8 lbs. And yet the sheep of Rambouillet are acknowledged to be superior to any in Europe, so much so, that Mr. Delessert in a letter of the 9th February last, mentions to me, that prime rams from that flock, were sold at 1500 francs, (300 dollars). While other prime blooded Spanish Merinos, only sold at from 200 to 300 francs. Lest those who have not seen my sheep,

should suppose that these heavy fleeces are inferior to the lighter ones of other flocks in quality, I need only observe, that the Rambouillet fleeces, from which mine are derived, are the finest in Europe. That my wool has sold constantly to manufacturers at two dollars per pound in the yolk, and is purchased with great avidity. To you sir, who have seen samples of it, I need say nothing on this subject, since you are well satisfied of its superiority. And in the letter you did me the favour to write, July 2d, 1809, you say, that you have shown the specimens to the members of the Cattle Society, and that it was agreed that none of you had seen such beautiful samples; and you add, "the staple is double the length of Col. Humphreys' ram which I had two years, and had a silkiness and wavey appearance which the other is intirely deficient in."

The following statement will serve to show the quantity of provender consumed by five Merino three-quarter wethers in England, and their consequent increase in weight. The sheep were exhibited at the Cattle Show of Lord Somerville, in March last, in London; and had been fed by Morris Birkbeck, a well known respectable agriculturalist.

Weight, Nov. 30, 1809,	-	-	-	537 lbs.
„ March 2, 1810,	-	-	-	670 lbs.
Increase,				133 lbs.

		Cwt.	qrs.	lbs.
Having eat, of hay,	-	10	3	2
turnips,	-	21	1	20
100 oil cakes,	-	2	2	20

Notice has been taken by Mr. Dupont, of the remark I made, p. 87, "that Don Pedro has very little wool on his legs." The present deficiency in that respect, observable in him, he ascribes to his great age, and says, that when younger he was clothed down to the hoof, that his progeny carry the same mark, and that he thinks it characteristic of true thorough bred stock. It is a fact however, that Mr. Smith's ram had but little wool on

his legs, and yet that the highest price was offered for his fleece by a manufacturer; and further, that the progeny of Merinos of the same cross, differ much in the proportion of wool on their legs. This remark I have often made when examining my own flock, and that of others. It may be well to attend to the circumstance, in order to determine whether there be any absolute connexion (in the full blood) between very woolly legs, and quality of fleece.

The following account, from the *Virginia Argus*, of the utility of salving sheep, is recorded as confirmation of that practice recommended in the first number.

Mr. PLEASANTS.—I have long thought of communicating to the public, a remedy for the cure of the rot and scab in sheep, which I have made use of with very great success. In the year 1806, my flock was so very indifferent, that from ninety sheep, I sheared only 130 weight of wool, so sorry as to be barely fit to make clothing for young negroes. Immediately after shearing I made use of the following mixture:—Three gallons of tar, and three gallons of train oil, boiled together, to which were added three pounds roll brimstone, finely powdered and stirred in. This quantity was sufficient for the above number, and was poured on with a kitchen ladle, from the top of the head along the back bone, to the tail.

At the next shearing, (in 1807) from seventy-eight of the same sheep, I sheared 360 lbs. of very good wool, and instead of twenty to twenty-five sorry lambs, commonly raised from my flock, I raised fifty-five as fine as ever I saw. Since this application, I have frequently been asked by my neighbours where I got such fine sheep. This remedy was taken from an old eastern paper, which I am sorry to say, I have lost or mislaid. It may be necessary to add, that I have continued to make use of this application with the same success, and that when train oil is difficult to be had, any kind of grease, such as is used for plantation leather, will answer. ..

I am Sir,

Your obedient servant,

J. NELSON.

Mecklenburg, 13th June, 1808.

REMARK.—The quantity of the salve put on in the above instance, was certainly greater than requisite, and must have stained the wool to a great degree, so as to lessen its capability of receiving delicate colours. Butter, and tar or wax, are much preferable.

On Wednesday, 5th Sept. 1810, at the Merchants' Coffee House in this city, at one o'clock, commenced the sale of twenty-five Merino Sheep, advertised to be sold by Messrs. Freeman & Passmore. The concourse of people that attended was greater than is remembered on any similar occasion.

The sale continued two hours, during which time the whole flock, consisting of nineteen Ewes and six Rams, were sold at the following prices:—

No. 1 Ram, - - -	\$200	No. 14 Ewe, - - -	\$400
2 " - - -	280	15 " - - -	235
3 " - - -	370	16 " - - -	360
4 " - - -	315	17 " - - -	140
5 " - - -	300	18 " - - -	250
6 " sick - - -	140	19 " - - -	185
7 Ewe - - -	420	20 " - - -	165
8 " - - -	200	21 " - - -	160
9 " - - -	230	22 " - - -	105
10 " - - -	190	23 " - - -	255
11 " - - -	255	24 " - - -	350
12 " - - -	375	25 " - - -	150
13 " - - -	230		

The average price of the healthy rams appears to have been 293 dollars each, and the average price of the ewes 229 dollars and 31 cents. Total amount of the sale of 25 Merino Sheep 5900 dollars.

Another cargo has arrived since the above; and were sold at private sale. Thirty-three ewes brought 250 dollars each. Mr. John Warner and Messrs. Dupont and Bauduy purchased eleven ewes and two rams: the latter at 350 dollars each.

Three rams were sold to Mr. John Wright, and seventeen ewes. Five were reserved for a person in New-York.

From the Agricultural Museum, of Georgetown, Maryland.

Extract of a Letter from CHANCELLOR LIVINGSTON, to Mr. CUSTIS, of Arlington, dated 29th June, 1810.

My sheep shearing this year offers the following curious and encouraging facts :—

The average of the fleeces of my three stock rams, was upwards of nine pounds fourteen ounces ; and one of them weighed 11 lbs. 11 oz. which sold at two dollars per pound, as it came from the sheep's back. I believe the United States have never before witnessed a fleece that sold as this did, at more than twenty-three dollars. The average of the ewes' fleeces, the whole number being 196, was equally interesting, as you will see from the following statement :—

	lb.	oz.		lb.	oz.
Half bred ewes averaged	5	1	heaviest fleece,	8	
3-4 do. do.	5	3	heaviest fleece,	7	9
7-8 do. do.	5	6	heaviest fleece,	8	4
Full bred, do.	5	13	heaviest fleece,	8	12

From this it appears, that the weight of the fleeces is proportioned to the purity of the blood, and that in crossing with these sheep we not only gain in the value of the wool, but in its quantity, which I am told is more an object in your state than the quality. If so, cross your long woolled ewes with Clermont Merino rams, and I am persuaded that you will add to the weight of their fleeces.* The next thing worthy of observation is the improvement on my stock since the last year ; the average of my full bred ewes was then only 5 lbs. 2 oz., this year they have gained nine

* This will certainly be the effect. But the difference in the nature of the long or combing wool, and the short or carding wool, which is particularly adapted for clothing, should be kept constantly in view. The improvers in England, from a conviction of the importance of keeping the two breeds separate, constantly have crossed the Merino with the short woolled native stock of the country. Such is the Ryeland breed of Herefordshire, upon which Dr. Parry, Mr. Tollet and others have formed their excellent flocks. See Archives, No. 1. EDITOR.

ounces per head, though the keep was exactly the same. I attribute this to two causes, first to the better selection of rams, which I am now able to make, admitting none to my flock that are not very fine, and that yield less than 9 lbs. of wool;—and next, to the general improvement occasioned by keeping and climate, for it is upon the young ewes that the gain is most—the old ones remaining as they were last year. A third inference from these facts is, that it will be very practicable to have a flock of ewes, whose fleeces shall average at least 8 lbs.; for if some give 8 lbs. 12 oz. and several 8 lbs., there can be no doubt that when I begin to select my ewes as I do my rams, and sell those that have the lightest or coarsest fleeces, I may bring them to 8 lbs., which is about the standard of the Rambouillet flock, and more than the double of the flocks of Spain. It is by this mode of procedure that the flock of Rambouillet is so very superior to the Spanish flocks, both in the quantity and the quality of the wool. What will be the state of our manufactures when your farmers, instead of a few ragged sheep, keep flocks of 1000 Merinos, which any farm of 1000 acres may conveniently do? And let me add, what will be the difference in the circumstances of the farmer, who receives 16000 dollars a year for his wool, with less expense than it costs him to make 1000 dollars by his tobacco?

ON THE ESSENTIAL QUALITY OF WOOL, AND ITS DIVISIONS.

WHEN the fleeces are separated from the back of the sheep, they are found to contain different kinds of wool, frequently suitable to the fabrication of articles very dissimilar in their nature, and adapted to processes in the manufacture of a description totally different from each other. The chief business of the stapler is to separate the portions of this mingled mass, to distribute them in their proper order, and to supply the manufacturers with the peculiar kind of wool required by the goods which each of them makes.

Various names are given to wool, according to its state, or relative degree of fineness. When first shorn, it is termed a *fleece*; and every fleece is usually divided into three kinds, viz. the *prime*

or *mother-wool*, which is separated from the neck and back; *seconds*, or that obtained from the tail and legs; and the *thirds*, which is taken from the breast and beneath the belly. This general classification of wool corresponds with the Spanish method of sorting into *Refinos*, or prime; *Finos*, or second best; and *Ter-ceras*, or inferior sort: but the wool-staplers in the eastern part of England, distinguish not less than *nine* different sorts, that are broken out of small fleeces, the names given to which prove the nice discernment of the persons employed. They are therefore, subjoined for the information of our readers.*

"No. 1. Is *Short-coarse*, and very descriptive of its character.

"2. *Livery*, } old sorts into which the fleece was formerly

"3. *Abb*, } divided.

"4. *Second*.—Probably a second or better *abb*, and the first altering in the mode of sorting; which arose either from the improvement of fleeces, or in the art of breaking them. This, and all the subsequent names seem to have been in their regular succession at the top of the list.

"5. *Downrights*.—Perhaps intended to convey the idea of superlative perfection.

"6. *Head* or *chief*.

"7. *Super-head*.—An advance upon the preceding sort.

"8. *Picked Lock*.—First made, perhaps, in small quantities.

"9. *Choice Lock*.—Still more excellent.

Besides these sorts, there is another, recently introduced into the list, and called *Prime Lock*; which, as its name indicates, is the finest possible that can be obtained.

The names of the others are derived from these; and the sorts which they represented are introduced into those parts of the scale where the divisions of it were sufficiently wide to admit them. They are described as a *Better Livery*, *Small Abb*, *Best Second*, and by other epithets of the same kind. This catalogue of sorts rises according to the hair or fineness of the pile, and is calculated to receive that portion of the fleece which is adapted to cloths of the lighter colours; and in order to receive what is suit-

* For these interesting distinctions we are indebted to Mr. Luccock's valuable treatise on "The Nature and Properties of Wool," 12mo. 1805, p. 142.

able only to the stronger tints; we run parallel to it a list of sorts usually denominated Greys, of the first, second, and third order. The French manufacturers, who are sometimes very exact in their mode of sorting, particularly for the more delicate branches of the manufactures, have been recommended by M. D'Aubenton to make use of a micrometer, in order to ascertain the size of the hair with more perfect nicety. The pile of my own sorts, when examined by means of a lens applied to a graduated scale, generally arranges itself within the following dimensions. The Breech or Short coarse, receives all the short and very inferior locks, and the Livery, those of a finer kind; but with a considerable latitude of hair. The diameter of the pile in all the others will be represented if we divide an inch, which we consider as unity, by the number annexed to each of the names.

Better Livery by six hundred.

Fine-Grey — seven hundred and twenty.

Seconds — eight hundred.

Downrights — nine hundred and twenty.

Head — one thousand.

Super — eleven hundred and sixty.

Picked-Lock — twelve hundred and eighty.

Choice — fourteen hundred.

A sample of moderately fine Spanish wool reached sixteen hundred.

These numbers it is added, are the average of repeated measurements: and are by that able writer considered as the standard of the sorts, to whose names they are respectively affixed.

Whenever therefore a wool stapler buys fleeces, his object is to procure at a given price the largest possible proportion of the superior kinds; fineness of pile being the principal consideration. Thinness of hair can very seldom be regarded as injurious to a fleece; while coarse hair, frequently renders it unfit for various purposes. The following are the principal objects of attention in the present state of the woollen manufactures: viz.

1. The *length of the staple*; for this regulates the various fabrics to which the fleece is destined, and produced by instruments of dissimilar construction, viz. the card and the comb. Thus, in

carding wool, a *short pile*, and a disposition to "assume a crumpled, or spring-like shape, is an object of prime importance." This shrivelling quality, Mr. Luccock remarks, p. 147, cannot prevail in too high a degree; if it be to make cloths requiring a close and smooth surface. But for cloths, where a long and even nap is required, such as blankets and cloths intended for large surtouts, too large a proportion of this curling property he conceives would be detrimental, by rendering the nap less uniform and compact, and consequently a *long pile* or *staple* will be preferable. Hence it will be obvious to every attentive cultivator, that wool must be grown for particular purposes, according to the nature of the manufactures carried on in his vicinity. There is, however, a certain point, beyond which, if this crumpling quality proceeds, the wool becomes less valuable, on account of the superior length of the curves, which render it difficult to break the staple sufficiently. The distribution of the hairs in this staple has been compared to that of the grain in a very crooked piece of timber, or to waved bars of metal so formed that the convex part of one fits into the concavity of another. As this peculiar property cannot be communicated to wool where it does not naturally exist, breeders of sheep will find it essential to their own interest, to unite the valuable properties of wool with those of the carcase.

2. Pliability of wool is another important quality to which the attention of the grower should be directed; as, without this it will be unfit for the purposes of manufacture. The Spanish wool possesses this quality in an eminent degree. Woollen articles require a great variety in the degrees of elasticity possessed by the wool from which they are made. Blankets, fearnoughts, and shags, require a large proportion of it, but in the finer and thinner fabrics, a great degree of it is injurious, causing these substances to feel hard and prickly. Hence the shears, heated plates under press, and singeing stoves, are employed to form a smooth soft and glossy surface.

3. The peculiar quality, by Mr. Luccock termed the *felting quality*,* is of equal importance with the preceding, and, though not evident to the eye, is in fact indispensably requisite in all

* Treatise on Wool, p. 161.

wools which are wrought up into such cloths as are submitted to the action of the fulling mill. Mr. L. describes it as "a tendency in the pile, when submitted to a moderate heat, combined with moisture, to cohere together, and form a compact and pliable substance." This valuable property is possessed in a higher degree by the Spanish sheep; and, according to Mr. L's opinion, the Cheviot, Morf, and Norfolk [English] fleeces, are best adapted for the purposes of fulling.

[According to Monge, (*Annales de Chimie*, tom. vi. p. 300,) "The felting of wool or hair, is an effect resulting from the external confirmation of their fibres, which appear to be formed either of small lamina placed over each other, in a slanting direction from the root towards the end or point of each fibre, like the scales of fish lying one over the other in succession from the head to the tail; or of zones placed one upon another, as in the horns of animals: from which structure each fibre, if drawn from its root towards its point, will pass smoothly through the fingers, but if drawn in a contrary direction from the point towards the root, a sensible resistance and tremulous motion will be felt by the fingers. This peculiar confirmation disposes the fibres to catch hold of each other, and as they cannot recede when acted upon by a progressive motion, they naturally advance by a similar motion from the end towards the root. ED.]

4. A soft pile is also an essential requisite to constitute a good fleece. In this, as well as in the other properties already enumerated, the Spanish wool peculiarly excels: and, among the British fleeces, those of Shetland stand unrivalled in this respect.

5. The specific gravity, or relative weight of the pile, is a quality to which the attention of wool growers has not yet been directed so particularly as the subject requires. In order to ascertain the comparative weight of different samples, Mr. Luccock directs each of them to be brought as nearly as possible to the same degree of purity, to expel all the moisture which wool obstinately retains, and extract all the air contained in the interstices of the staple. The importance of rendering wool as light as

possible, is clear to every one who considers that the quantity of cloth, which a given weight will produce, is the true test of its value.

6. The smell of wool is not a property to which much weight can attach, provided no disagreeable odours are emitted, or any of the effects of moisture are exhibited. Mr. L. considers no one scent to be preferable to another. It is, however, essential that wool should, as far as possible, be perfectly *white*.

7. The last property to which the attention of the cultivators of wool should be directed, is "*trueness of hair*," or a uniform regularity of pile, in which no coarse, shaggy hairs are perceptible; as the latter, by reason of their brittle nature, will very materially affect the progress of the manufacturer. Such coarse hairs, as well as kemps or stichel hairs (which are generally short, brittle, pointed, opaque, and of a grey or brownish cast,) are found principally in neglected breeds. Since, however, the art of combining the properties of the parent sheep in their offspring has become generally known, the expert cultivator of wool has been enabled to produce surprising alterations in its relative weight and fineness.

Mr. Luccock remarks, that when sheep produce wool sufficiently short to meet the wishes of the manufacturer, the operation of shearing should be deferred, at least if no particular advantage to the animal is to be obtained by clipping it sooner, until the new coat appear like a fine downy substance mingled with the bottom of the staple: for this being shorn with the old fleece renders the pile more suitable to the manufacture of woollen cloths. It is naturally soft, fine, and unelastic; contributes to the delicacy, solidity and strength of the thread into which it is twisted, and can be brought to display upon the surface of the cloth the superiority of its qualities. These remarks being so different from the common opinion, deserve attention from the farmer and manufacturer. They will bear in mind that they are only applicable to the common breeds of sheep, not to the Merino.

ADDRESS OF THE LINNEAN SOCIETY.

Philadelphia, 16th Aug. 1810.

DEAR SIR,

AS chairman of the committee, who were appointed by the **PHILADELPHIA LINNEAN SOCIETY**, to address the citizens of the United States, on the subject of the natural productions used in the arts and manufactures, I have to request you will have the goodness to insert the accompanying address in your "*Archives of Useful Knowledge*."

I am extremely well pleased with your useful though arduous undertaking; and from the specimen presented to the public (of your first number) no doubt can be entertained, but that your zeal in the cause of science, and every kind of useful information, will receive the sanction and support of the citizens of the United States.

In truth, sir, to appreciate the value of knowledge, is to know its utility; and no means however simple, can demonstrate this fact, more than that of diffusing information through the channel of a periodical work, by drawing such conclusions, founded on its application to the arts or manufactures, which are more immediately adapted to the subject under consideration. To the man of science, the artist and manufacturer, an extensive field presents itself in our country; indeed, where the productions of nature are numerous, and their uses known, their application to *some* useful purpose must follow as a natural consequence; the contemplation of which, would arise not merely from motives to gratify the scientific portion of society, but an absolute conviction, that their utility to our country, in the manufacture of a thousand articles, by adding to our wants and comforts as a people, would relieve us from foreign dependance.

If, then, by introducing matter of so important a nature to the public eye, it will tend, and irresistibly impel, our ingenious countrymen to apply such knowledge at least to the improvement of the arts or manufactures, a great point will be gained. In this light I consider the "*Observations on Sheep*," published in your first number; and having read them with attention, I can do no

less than remark, that they are particularly calculated to excite, not only the attention of the scientific, but of the agricultural reader. The introduction of so valuable a breed, as the Merino, into our country, is a great acquisition. Every means ought to be taken to facilitate their growth and number, as well as the common breed of our country; for we live in the hope, that ere long woollen cloths will be WHOLLY manufactured within ourselves. The conclusion, therefore, would be, that as our country abounds in the most useful productions of the animal, vegetable, and mineral kingdoms, their application to our immediate wants, will render us independent of Europe, and cause the manufacturing interest ultimately to become that of the commercial.

I am, dear sir,

With sentiments of the highest consideration and esteem,

Your obedient humble servant,

JAMES CUTBUSH.

JAMES MEASE, M. D.

Secretary to the Agricultural Society, &c.

ADDRESS

Of the committee of the Linnean Society of Philadelphia, to the citizens of the United States, on the subject of the natural productions employed in the arts and manufactures.

To every nation, it ought to be an object of the first importance, that it should possess within its limits, the natural productions essential to manufactures and the arts.

A nation, which depends on another for the supply of its necessary wants, or the materials for its labour, cannot be entirely free. It is placed under such disadvantages, that seldom will it dare to maintain its rights against the aggressions of the government which commands its supplies.

A large portion of its citizens, accustomed to consider a foreign nation as the immediate instrument of support, of acquiring wealth, or yielding the enjoyments and conveniences of life, contract foreign partialities and foreign prejudices. They are more connect-

ed and more attached by interest to the government, whose trade maintains, whose manufactures clothe, and whose luxuries enervate them, than to that, which gave them birth, gave them independence, gave them freedom. The short suspension of our commerce taught the American people these truths. It exhibited the inconvenience;—it did more, it exposed the destructive evils of a dependance on a foreign government for goods of daily and domestic use. It proved that to be free, a people should possess not a government and laws of their own only; but, that they must have their own WORKSHOPS. It showed that freedom consists not in a mere exemption from political subjection, but also from moral servitude.

In viewing the present zeal for the establishment and promotion of manufactures, every patriot's breast must glow with virtuous feeling. The contention, for so it may be termed,—the contention for their establishment, is a strife for the independence of the country. The battles of the revolution broke our chains asunder, but they still cling around us; the spirit for manufactures, is now to cast them from us for ever.

To lend their feeble aid in this important endeavour, is the ambition of the PHILADELPHIA LINNEAN SOCIETY; and they believe they can the better accomplish this object, by directing their researches to the discovery, in this country, of those subjects, which, coming under their notice as a society of natural knowledge, are the objects of commerce and the materials of manufacture.

The list of Articles of the *Materia Medica* of the United States, is already extensive and important. Many of its contents supersede in the practice of our physicians, the drugs of Europe and Asia.* By research and experiments, it no doubt could be greatly enlarged and improved to the advantage of the nation, and benefit of individuals.

Our forests yield some plants, which, as dyes, for brilliancy and permanency of colouring, are not surpassed by any of South America or India; the number is, however, small, and the range of hues confined.

* See Barton's Collection towards a *Materia Medica*

Our country is prolific of some metals. Yet antimony and mercury are unknown as its productions. Arsenic, cobalt, copper, and the precious metals, have been found in such small quantities or peculiar states, as to render them little valuable or useful.

There can be no reason why all these metals should not exist abundantly in this country. There is every probability they do. The rocks, which are their gangues in other countries, in our own are generally diffused. It is indeed no stretch of credulity to believe that their ores are every day trodden under foot, turned up by the plough or spade, and thrown away or regarded as useless, from ignorance of their value. Similar cases have been known; of which the following may be cited:

Black jack, an ore of zinc, now largely employed in the making of brass, a few years past was used in Wales, for mending the roads; and the cobalt ores of Hesse, which now yield a neat profit of 14,000 pounds sterling per annum, were formerly employed for the same purpose.*

If ignorance should have caused, in Europe, at a late period, such a misapplication of valuable and productive ores, how very probable is it, that in this country, where hardly one in a thousand has a superficial acquaintance even with their appearance, that they may be in the hands of hundreds; may be used for common purposes constantly, and their importance never suspected.

It has happened, that valuable ores have remained unworked, to national and individual injury, from a just diffidence in the proprietors of expending their money fruitlessly, as they could not obtain a knowledge of their nature and richness.

Others again, deceived by appearances or the false representations of designing men, have disbursed considerable sums, and wasted much time in the useless search for metals, when a metallurgist would at once have pronounced that no ore existed, or it was one too poor to be profitable.†

* Watson's Chemical Essays, vol. 1st, page 45.

† This has actually happened. A company was recently formed to work a copper mine, and many thousand dollars expended in the apparatus preparatory to commencing work. Upon examining the ore, Mr. Godon, of Philadel-

To assist, therefore, in obtaining a full knowledge of the medicinal and dying drugs indigenous to our soil ; to expedite the discovery of useful metals ; to aid the manufactures of their country, as far as they are connected therewith ; and to remove the inconveniences and disadvantages of individuals not possessing an acquaintance with natural knowledge, the Linnean Society of Philadelphia has directed the undersigned committee to give this public notice, that any plants, ores, or any mineral substance whatever, which shall be forwarded to any member of the committee, shall be examined by the botanical and mineralogical departments of the society. The result of the examination shall be communicated, as soon as completed, to the person transmitting such specimens, together with such other information relative to its nature and uses, which the society can impart.

JAMES CUTBUSH,
SAMUEL JACKSON, } *Committee.*
SAMUEL BENEZET, }

CHINESE SOY.

THE agreeable flavour which the Chinese and Japanese *Soy* communicates to fish is well known. But the high price of the article confines its use to few persons. Hence it has always been an object to discover the peculiar mode of preparing it. Several processes, particularly those by Professor Beckman, M. Ekeberg, and by Sir Tilloch, have been published ; which have been copied into various periodical publications, and Encyclopedias.

It will be seen however, that the following method, carries internal evidence of coming nearer to the truth than any other, and is therefore recommended to our readers. The Editor has the satisfaction to assure them, that the Bean, *Deliches Soyæ*, bears the cli-

phia, persuaded them to abandon the project, the ore being of that kind, which repeated experience in Europe had proved, would not repay the labour necessary to smelt it. EDITOR.

mate of Pennsylvania well : there is therefore nothing to prevent our enjoying the agreeable condiment, of which it is the basis; except our own indifference. Accounts of the trials of the recipe will be thankfully received.

METHOD OF PREPARING THE CHINESE SOY.

*By M. DE GRUBBENS : extracted from the Memoirs of the Academy of Sciences at Stockholm for 1803, first Quarter, by M. LINDBOM, captain of the Swedish Mines.**

THE transactions of the Swedish Academy for the year 1764 contain a description of the method of preparing soy, by the late captain Ekeberg; but as this description is incomplete as well as incorrect, since the real Chinese soy will not be obtained by following it, I am fully persuaded that M. Ekeberg never saw, nor was acquainted with, the true process for preparing this substance. There is reason to believe that he gave his description from the accounts of the Chinese, who are not always ready to speak the truth, as I observed during the five years I resided in China, when I wished to obtain complete information in regard to the method of managing a certain kind of silkworm which spins five or six times every year : the method of dyeing silk and cotton, and various other particulars in regard to the Chinese economy.

Having since obtained, for a very high price, certain information in regard to these points, I have seen how much their accounts differed from the truth. The case was the same when I wished to be made acquainted with the preparation of soy ; but as I have now procured a very correct account of it, I think it my duty to communicate it to the academy.

Soy is prepared from a kind of beans, which are whiter and smaller than those of Turkey, the farina of wheat, salt, and water. The proportions are, 50 pounds of beans, 50 pounds of salt, 60 pounds of the farina of wheat, and 250 pounds of water.

After the beans have been well washed, they are boiled with well-water in an open pot for some hours, or until they become soft enough to be kneaded with the fingers. During the boiling

* From the *Annales de Chimie*, No. 148.

they must be always covered with water that they may not be burnt. Care must be taken not to boil them too much : if they are diluted, too much of the substance remains in the juice. When the beans are boiled they are put into large flat wooden tubs, or, as the Chinese do, into vessels made of thin broad splinters of bamboo, two inches and a half in depth and five feet in diameter. In the latter they are spread out to the depth of two inches. When they are sufficiently cooled to be touched with the hand, the farina of wheat is added, and well mixed with them ; and this is continued till the whole farina is exhausted. When the mass becomes too dry for the farina to adhere to the beans, a little warm juice is added.

When the whole is well mixed, the mass is spread out in the tubs above mentioned, taking care that the strata are not more than an inch or an inch and an half in thickness. The mass is then covered, by placing over it a lid which exactly closes it. When it is observed that the mass becomes mouldy, and that heat is disengaged from it, which takes place in the course of two or three days, the cover must be raised up, by placing two rods below it, in order that the air may have free access. In the mean time a rancid odour is exhaled. If the mass assumes a green colour, it is a sign that every thing goes on well ; if it begins to grow black, the cover is raised a little more, in order that the mass may be more in contact with the air. When the mass becomes completely black it is entirely spoiled.

As soon as it is observed that the whole mass is green and mouldy, which is generally the case in eight or ten days, the cover is removed, and the mass is exposed for some days to the air and the sun.

When the whole mass has become hard like a stone, it is cut into small fragments, which are thrown into an earthen pitcher, and 250 pounds of water, in which 50 pounds of salt are dissolved, are poured over them. The whole is well stirred ; and the height which the water occupies in the pitcher is noted. In case one pitcher is not sufficient, the mass is put into several, taking care that each be proportioned to the quantity of the matter.

When the pitcher is thus filled it is placed in the sun. The matter must be regularly stirred and shaken every morning and evening, but at night care must be taken to put the cover on it to preserve the mass from the cold. This cover is made convex on the outside, that the rain may more readily run off from it, and it is employed also in the day-time, when it rains. The greater the heat of the sun, the more the preparation of the soy is accelerated. This operation in general is undertaken only in summer, and yet it continues for two or three months.

In proportion as the mass decreases by evaporation, well-water is added, and this is continued till the salt water has entirely dissolved both the farina and the beans. The pitcher is then left some days longer in the sun, in order that the solution may be so much the more perfect, as on this depends the good quality of the soy, and even during this time the matter must be stirred every day.

When the mass has become very succulent and oily, the whole is poured into bags, which are pressed to squeeze out the soy, which is then pure, and ready to be employed. It is not boiled, as M. Ekeberg asserts. It is then put into bottles, which are well closed. The Chinese, who deal in this article, put it into large pitchers. The soy, before it is squeezed out, is of a dark brown colour, but it afterwards becomes black.

The Chinese prepare from the refuse that remains two other kinds of soy. The first time they add 150 pounds of water and 30 pounds of salt: having squeezed this mass, they again pour over it 100 pounds of water, proceeding always in the same manner as above described.

The last two kinds are not strong, but very salt; especially that of the last extraction, the colour of which is always clear. These two kinds are the commonest in China. The difference between them is as 8, 4, 1.

In the year 1759, I prepared in this manner, in my lodgings at Canton, all the soy which I employed. I even brought some bottles of it to Sweden; it was succulent, oily, moderately salt, and entirely different from that usually sold in Europe: in regard to

its taste it was equal to that of Japan, which is generally considered as the best.

This description is the more certain, as I always executed the preparation myself: I will even venture to assert, that it is that used to obtain soy of the best quality.

M. Ekeberg asserts that the soy is boiled, and that sugar, ginger, and other spiceries are added; but this is void of foundation, and cannot be true, since a Chinese pound of soy does not cost more than two *canderins* Chinese money, which are equal to one and one-third skilling Swedish.* This was the usual price during my residence in China, and there is no reason to believe that these ingredients were employed in the preparation of it. Besides, soy has no taste either of sugar or of spiceries; the prevailing taste is that of salt.

EXPERIMENTS AND OBSERVATIONS

On the saline or fixed ingredients of the Congress Spring, at Saratoga, in a letter from JAMES CUTBUSH to Dr. BENEZET, communicated to the Editor.†

SECTION I.

Examination of the saline matter of Saratoga.

EXP. 1. TO a sufficient quantity of pure water, I added the powder, and digested it for some time. The insoluble portion was separated by the filtre, and was repeatedly washed. A part of this solution was put into a wine glass, and some of the oxalate of pot-ash was added, which produced no change.

EXP. 2. Carbonate of ammonia, added in the same manner, produced no precipitate.

EXP. 3. Caustic pot-ash had no effect.

EXP. 4. Muriate of barytes gave a white precipitate, insoluble in muriatic acid.

EXP. 5. Sulphate of silver, added in a similar manner, gave a copious precipitate.

* A canderin is equal to about 3 sous and 7 1-2 deniers French money.

† The saline matter upon which these experiments were made, was brought by the publisher from the spring.

EXP. 6. Nitrate of silver had the same effect.

EXP. 7. Tincture of galls produced no change.

It may be proper to remark, that neither litmus nor turmeric paper were changed on immersing them into the solution, which therefore proves, that no excess of alkali nor acid was held in solution. These experiments shew, that the soluble part contained no lime (Exp. 1.), nor, indeed, any earthy matter (Exp. 2 and 3.)

Experiment 4 proves, that a sulphate was held in solution, and, from the former experiments, is an alkaline sulphate. The presence of a muriate was discovered by experiments 5 and 6, and from similar reasons, is an alkaline muriate. Experiment 7 shews the non-existence of iron.

These experiments are conclusive, and determine only the presence of neutral alkaline salts.

SECTION II.

Examination of the part which remained after the affusion of water.

EXP. 8. To a portion of the dry powder, which was of a grey colour, I added some nitric acid: a violent effervescence was produced.

The acid was soon saturated; the solution was diluted with water, and filtered. The insoluble portion, which was exceedingly small, I concluded was silica.

EXP. 9. To a part of the nitric solution, oxalate of pot-ash was added. A precipitate, at first scarcely perceptible, but afterwards copious, was produced.

EXP. 10. Carbonaté of potash added to another portion, occasioned a precipitate, which was soluble with effervescence in muriatic acid.

EXP. 11. Caustic potash also produced a precipitate.

EXP. 12. Carbonate of ammonia had the same effect.

EXP. 13. After the addition of carbonate of ammonia, the whole was filtered to separate the precipitate; and phosphate of soda was added to the filtered liquor. A copious precipitate now appeared.

Exp. 14. The precipitate produced by the carbonate of ammonia, in the first instance, was put into a wine-glass with a portion of muriatic acid; an effervescence took place; and the addition of oxalate of potash caused an abundant precipitate.

Exp. 15. Alcohol of galls was added to a portion of the nitric solution, which struck a slight black colour. These experiments, upon the whole, appear to confirm the analysis made by some able analysts, and serve to shew, that the experiments of Dr. Seaman (which we shall afterwards notice) exhibit the solid contents pretty accurately.

Experiment 8, however, indicates the presence of carbonic acid, which was united with the earths, forming sub-carbonates.

You will perceive, Sir, this circumstance evidently proves, that, in obtaining the solid contents of the water by evaporation, the proportion of carbonic acid necessary to hold the earths in solution, was disengaged; consequently, in obtaining the saline matter, the heat separated this portion of carbonic acid, and left the earths, in the form of sub-carbonates, accompanying it.

The addition of oxalate of potash to the nitric solution, is a proof, that lime was held in solution. This fact was also shewn, although in a general way, by Experiments 10 and 11, for these reagents will precipitate all the earths with one or two exceptions.

Experiment 12, shews also the presence of earths; but, however, as the carbonate of ammonia has the property of holding the magnesian earth in solution in the common temperature, the fluid was filtered after adding the ammoniacal carbonate; on the addition of phosphate of soda, in Experiment 13, a precipitate appeared, indicating the presence of magnesia. This precipitate is a triple compound of phosphoric acid, magnesia and ammonia.

Experiment 14, confirms the fact already advanced respecting the presence of calcareous earth. The last experiment discovered the presence of iron.

This section of experiments discovered the following substances: carbonated lime, carbonated magnesia, carbonated iron, and silica.

SECTION III.

Examination of the saline matter by evaporation, &c.

THE residue of the solution made with water was exposed to the solar rays, and, when it was sufficiently evaporated, I added a portion of alcohol to a part.

The object of this experiment was to separate the salts, which are insoluble in this fluid, or to ascertain if any existed, in addition to the other experiments. Mr. Kirwan remarks, that when alcohol is mixed with an equal quantity of a saline solution, it will precipitate all the salts it is incapable of dissolving. I will merely add, that alcohol is useful in chemical researches of this nature, in consequence of this property it possesses. It is susceptible of dissolving most of the earthy muriates, some earthy nitrates, &c.; but these were not discovered. In the same manner the sulphates, with one or two exceptions, are incapable of solution.

The turbidness, therefore, which appeared on adding the alcohol, was the alkaline muriate and sulphate in the act of precipitation.

The alcohol was of the standard specific gravity.

EXP. 17. To a portion of the saline matter obtained by evaporation, a few drops of dilute sulphuric acid was added; an effervescence ensued.

On holding a feather moistened with ammonia over the vessel, copious white fumes (muriate of ammonia) were formed.

This experiment also proved, that the saline matter contained muriatic acid.

By a further evaporation of the remaining fluid, until it discovered a disposition to crystallize, and on letting the vessel stand undisturbed, I had the pleasure of observing an immense number of cubic crystals on the following morning, which recognized the presence of muriate of soda or common salt, and especially the presence of soda, the basis of the muriatic salt.

Among the group of crystals, I discovered with a magnifying lens, some small actahedral crystals of a prismatic or cuneiform figure, having two terminating pyramids truncated near their

basis. This crystal may, therefore, be said to resemble the crystal of Glauber's salt ; and the sulphuric salt is a sulphate of soda.

REMARKS.

The remarks I have to offer, relative to the observations of Dr. Seaman, though they are general, may, in all probability, be useful ; so far, at least, as will enable us to determine the nature of his experiments in relation to my own, especially in forming our conclusions relative to the fixed ingredients of these waters.

The Doctor, in his Dissertation on the mineral waters of Saratoga, second edition, observes, that these waters contain carbonic acid, carbonate of iron, supercarbonate of lime, muriatic salt, carbonated alkali, carbonated magnesia, and a sulphurous impregnation ; and that the Ballston water holds in solution carbonic acid, muriate of soda, carbonate of lime, carbonate of iron, carbonate of soda, and carbonate of magnesia.

Considering the experiments here detailed, it would appear, that the saline matter is similar to that pointed out by Dr. Seaman, with the exceptions we shall afterwards relate.

Besides the alkaline neutral salts, of which I have spoken, I have also noticed the presence of the carbonates of lime, magnesia, and iron ; all of which were held in solution in the mineral water, by an excess of carbonic acid. In fact, according to strict chemical nomenclature, these substances must exist in the state in which I found them, not as carbonates, but as sub-carbonates. With respect to the muriatic salt, to which the Dr. alludes, it appears, from some of the experiments, and particularly from the crystallization, to be a muriate of soda ; and in like manner with respect to sulphate of soda.

The sulphurous impregnation might have been observed at the spring, but then from the circumstance of its ready union with oxygen, the sulphuric acid must have formed ; and, in order to facilitate the formation of this acid, it might, in all probability have been disengaged from its subteranean situation in union with soda, forming a sulphuret, which, by decomposition, would con-

stitute a sulphate. This may have been the process of its formation, or, indeed, it might have been produced by the decomposition of an earthy sulphate by carbonated soda.

In conclusion, I may correctly state, that the fixed ingredients are as follows :

Sulphate of soda,
Muriate of soda,
Carbonated lime,
Carbonated magnesia,
Carbonated iron.

I wish much that it was in my power at this time, to examine the water at the place, by which I should be able to discover the quantity of the gaseous contents.

The silica, as it is uncertain whether it originally existed in the water, although it has been detected in mineral waters, I have not put down.

In order to facilitate inquiries relative to analysis, we ought to be in possession of all the facts respecting the subject of the examination ; and, more especially, to ascertain the nature and quantity of the volatile as well as the fixed ingredients. I was confined in my experiments, to the examination of the matter obtained by evaporation ; one pound of which is produced from ten gallons of water.

I remain, dear sir,

Yours, truly,

JAMES CUTBUSH.

SAMUEL BENEZET, M. D.

ARCHIVES

OF

USEFUL KNOWLEDGE.

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ADDRESS

TO THE CULTIVATORS, THE CAPITALISTS, AND MANUFACTURERS OF THE UNITED STATES.

THE times require your enlightened co-operation in the improvement and extension of *the national industry*. An unprecedented course of foreign misconduct, demands equally of your interests and of your virtues, a deportment corresponding with the new situation into which we are drawn. The subject of WAR, as a possible remedy for the disorder of the times, is studiously left to other pens, and is respectfully submitted to the proper authorities of our neutral country. But it is a consideration of the utmost importance, in favour of the public views, which it is proposed to suggest in these papers, that they may tend to manifest our vast resources for a just and necessary contest with any foe; and to indicate the means of their sure and economical improvement and increase.

Under the strongest impressions from these painful, injurious, and awful times, it is proposed to take the necessary view of certain divisions of our internal industry, in which the interests of the cultivators, the manufacturers, and the capitalists, well understood, appear to unite. We shall commence with the great and novel article, the importance of which has been so miraculously increased in the United States, by measures like these, and which

is rapidly advancing to the character of the greatest material for clothing, furniture, and diversified equipment, on the face of the earth.

COTTON.

THE woollen manufactures of Europe constitute one of the greatest rivals of the cotton cultivation of the United States, and of the increasing manufacture, at home and abroad, of that illimitable raw material. It is an instructive fact, that the woollen manufactures of Great-Britain have been steadily computed at a little more than sixteen millions sterling per annum, for the whole period between the peace of 1783, and the beginning of the present war in the year 1803.—The weight of the wool annually consumed there, varies little from the weight of our whole *surplus* cotton, as exported in the greatest year. If our cotton shall be impeded by the belligerents in its way to foreign markets, we must and shall manufacture many cotton goods, so as to rival foreign woollens. The American will not be uncomfortable in his own cotton velvets, velverets, corduroys, swanskins, and cotton blankets. The scarcity of hands is no objection to ginning, carding, spinning and plate printing by horse, by water, and by steam. An effect of their cotton manufacture has been to keep the woollen manufacture stationary in England for twenty years, during which the cotton branch has been raised from less, than one million sterling to more than ten millions.

The presence of the raw material will provoke to, excite and produce the manufacture.—This is a plain and a sound maxim.—We find it proved by the course of events, even in the instances of the most unnecessary, luxurious and difficult branches. Thus the presence of the *Grecian* marbles occasioned their formation into the most costly, exquisite, difficult and unnecessary manufactures in the world—their *marble statues*. Italy followed in this superfluous branch, because, *there also was the native raw material, and the Greek marble was adjacent*. France and Great-Britain have not offered to the world the *statuary's wares*, because they had not the marble; although, it is observable, that they have respectively made a distinguished figure in the more

exquisite and complicated relative manufactures of the painter, because importations constantly occasioned *the presence of the raw materials*. So of the people of the whole seventeen provinces of the Netherlands. They could make paintings, but not marble statues.

The presence of the most considerable mass of the best hemp, in Russia, has produced *an unrivalled excellence* in the finer sail cloth, and in the common sheetings of that country.

The various fossils of Great-Britain have produced an immense number of useful manufactures from mineral substances.

The moist climate and rich soil of Ireland produce the best flax in abundance, and the presence of that excellent raw material has occasioned the most celebrated manufacture of linens, which have been offered in the markets of the world.

The American cotton, in like manner, will surely produce the home manufacture with a celerity, *proportioned to foreign interferences with its rightful sale in external marts*. A strong collateral ground for this presumption is, that we have insensibly attained the actual manufacture of *all* the other raw materials, which are either the spontaneous productions of the earth, or the fruits of cultivation. The American *metals, wool, hemp, flax, and skins*, have, by their mere presence, produced the gradual rise of a body of regular and qualified manufacturers, actually competent to the manufacture, not only of all of them, which we can obtain from the landed interest, but all we can procure by means of importation. We have nothing to do in regard to those last five raw materials, but to increase their quantity, and to ameliorate their manufacture. It is the presence of cotton only, as a *redundant* raw material, which is to produce in the United States a new proof the truth of the maxim, that *the presence of the raw material will excite and produce the corresponding manufactures*.

Many important articles of public supply, for which the country paid excessive prices in the revolutionary war, can be made of the cotton, which Europe interrupts in its way to foreign markets. We were not aware, that we possessed the sources of this profuse raw material ; neither had we the gin to free it from

the seed ; nor the carding and spinning machinery, with which to manufacture it. We were not aware, that it would make blankets, of which (of foreign wool) there are twenty-five millions of pounds weight in daily use within our country. Its utility in girth webbing for military saddles, for belts of various kinds, for pantaloons, vest, jacket, trowser, frock, shirt, sheet, tent, knapsack, wagon, and sail cloths, twilled and untwilled, would ensure and cheapen that great mass of army and navy supplies, which have been made of raven duck, drilling, sheeting, ticklenbergs, dowlas, girth webbing, and even sometimes of leather, as in the case of belts. If the military blanket, by land and sea, ought to be of wool, except in the hospitals and garrisons, still the manufacture of cotton blankets facilitates and insures the command of woollen blankets in time of war. For there could be no difficulty, in a war of virtuous and sound principle, to obtain from the private owners of three millions and one half of woollen blankets, now and always in use, the exchange of a sufficient quantity for the soldiers and mariners, to be paid for in new, clean and good cotton blankets, on fair terms.*

The charges on the exportation of cotton wool to Europe, and upon importing it in manufactures from thence, amount to 50, 55 and 60 per cent. on the sterling cost of blankets, common velvets and corduroys, cotton drilling, girth webbing, and other goods of constant and general consumption. It is evident and certain then, that our good house-wives, and cotton manufacturers, are protected by a difference of more than 50 per cent, in their favour. It is a similar difference, which has created and

* That this opinion is well grounded, will be inferred, when it is known that during the revolutionary war, the patriotic citizens of Philadelphia parted freely, and without a call of government, with their blankets for the use of our army destined to invade Canada. If then they voluntarily gave these articles, and without any equivalent,—at a time too when, from the existence of a war, the means of replacing them was cut off, and when the method of manufacturing them in the United States was scarcely known, it cannot be doubted that the present generation will freely exchange their used woollen for new cotton blankets, should the increasing rapacity of the European powers force us to appeal to arms to recover and perpetuate our rights.—
EDITOR.

protected the coach-maker, the cabinet-maker, the gold and silver-smith, the paper-maker and stainer, the hatter, the plumber and the other manufacturers of *all* our hides, skins, flax, hemp, wool, and metals.

The various foreign invasions of our personal rights, and of our merchant vessels and ships of war, against all decorum, reason and justice, are powerful considerations in favour of every proper attention to the internal walks of our national industry. Our honest exertions, capital and skill, employed in the production of raw materials and subsistence for manufacturing families and their cattle, and in manufactures themselves, will give us *a great mass of certain, cheap and excellent supplies*, necessary in war, comfortable in peace, and profitable in both seasons.

GRAIN LIQUORS.

A FEW pages will be devoted to the exposition of the cane, fruit, and grain distilleries, and breweries of the United States: a great, important, increasing, and imperfect branch of American manufactures.

It is stated to Congress, in the report of the 17th of April, 1810, by the Secretary of the Treasury, that our grain and fruit distilleries made, so long ago as the year 1801, about nine millions of gallons of spirits. The distilleries from *foreign* molasses and coarse sugars produced, in addition, about three millions of gallons. The foreign spirits imported, in each of the years 1806 and 1807, when foreign molasses had failed, were nearly ten millions of gallons. Cider is made in very large quantities, and with great profit. We do not import this liquor. Our malt liquors are nearly equal to our consumption, for we import only 185,000 gallons, and the *cider* and beer exported under the proper names,* are 187,000 gallons, besides sea stores. Our breweries are a source of real, steady, and great profit. Foreign spirits are greatly advanced in price.†

* Beer is often shipt as "Merchandize."

† Windward Island rum in 1785, was sold at 42 cents, and is now worth 95 to 100 cents per gallon.

Two things then, appear within our power in the business of these common drinks : *first*, to improve the quality, and *secondly*, to increase the quantity. Apple orchards are known to be *very* profitable in the United States. By them we can increase, at pleasure, the good old farmer's manufacture—*American cider* : and we can furnish a raw material for the distillation of apple brandy, which when well made and ripened by keeping, is an excellent spirit. To these may be added peach orchards and pear orchards, for the manufactory of peach brandy and perry, or *pear cider*. These liquors are superior to the Spanish brandy and French rum, and to the Teneriffe, Fayal and other inferior wines.

Among the means of supporting the agriculture of this country, it is believed that there is none more sure, more easily practicable, nor more extensive, than the manufacturing out of our canes, orchards and grain, substitutes for the foreign beers, cider and spirits, and even for bad wines, which we import, and for the spirits made from imported molasses. The quantities of foreign spirits, at 10 millions of gallons ; of beer at 185,000 gallons, and of spirits distilled from foreign sweets, may be safely computed at 14 millions of gallons. These being often of the high proofs, would require above six millions of bushels of grain to supply the distillers, (and much more would be required to make beer) who should be employed in manufacturing American spirits to substitute for foreign. This quantity of grain is greater than that, which would be required to make all the wheat flour we ever exported in a year. The nations, who scandalously injure our rights, would lose the supply of our flour, the sales of their spirits and molasses for distilling, and often the freight of both, and their navies and privateers would lose the opportunity to plunder our property. So far as the cane, our new and valuable acquisition, could supply coarse sugars and molasses, the Louisiana planters could reap the benefit. From the sugar plantations on the gulph of Mexico, to the orchards of the northern and eastern states, nearly all the American cultivators might share, at their own pleasure, in the supply of the raw materials, whether cider, or spirits, or beer should be chosen for the drink of the consumer.

The breweries of Europe afford us the sure and easy means

to extend our present stock of information, in that very useful art and trade. The domestic brewery, or *household* or *family* brewing, as practicable in our climate, appears to be worthy of the labours of the patriot and the chemist.

The grain distillery of Ireland is also peculiarly worthy of American attention. They generally distil there from *malted* grain; a practice little known and less pursued in the United States. The quality of spirits distilled from *malted* grain, and matured by care and time, is much superior to any idea, which is generally entertained by the native American consumers. Justly prejudiced against much of the harsh and new grain spirits of our country, called *whiskey*, all distilled liquors, made from our grain, are despised and disliked by many, without an attempt to introduce improvements from abroad, or those of age and rectification.

Important discoveries in the manufacture of spirits and beers have been made by American genius. The discovery of colonel Alexander Anderson, a native of Maryland, now of Philadelphia, in regard to the practicability of brewing with a considerable mixture of *unmalted* Indian corn; the discovery by the reverend Burgess Allison, lately of New Jersey, now of Philadelphia, of the mode of extracting the essential oils from spirits when burnt; and the discovery by the last gentleman of the practicability of profitable distillation from the common Indian *corn stalk*, may be found worthy of the attention of the enquiring artist, and farmer. The two first are certain advantages: the last is said to promise much, according to several early but imperfect experiments.

The vast consumption of inferior lowpriced foreign wines in this country, is worthy of considerable attention on this occasion. The wines imported into the United States are about two millions of gallons per annum. Some are reshiped. As before observed, perry, cider and peach brandy are far preferable to sharp and ill-flavored wines. The improvement and increase of all our liquors would have a tendency to diminish the use of those in a degree worthy of the attention of the cultivator, who raises materials for our distilleries, and of the manufacturers and capitalists, whose industry, skill, and money are employed in the business.

The household preparations of fruit liquors in many families, and even by distillers, from the fresh and dried peach, grape, currant, and cherry, are not unworthy of our attention, and particularly as it is probable they will lead to many useful experiments in the cultivation of the vine and the manufactory of its proper juice, in a country like this, whose southern regions produce the orange in as much perfection as Spain and Portugal, and whose more northern districts extend into the climates of the claret, the Sauterne, the Tokay, the Hock, the Burgundy, and the Champagne. All the climates of the vine, in Europe, are found in United America.

The most enormous expenses of the American revolutionary war, and the deepest sufferings of the patriotic army, were those produced by the frequent destitution of wine, distilled spirits, and porter. It is therefore of the greatest importance to our possible military operations, that there is already a quantity of some of these liquors, steadily manufactured in our country from our own materials, equal at least to ten millions of gallons. Let us then *improve the manufacture* on the principles of *good business*, free from the losses constantly produced by foreign spoliation, and from motives of public spirit, raised by foreign indignity, outrage and rapine.

It will not be useless, or impertinent to the public interest, to entreat the attention of the learned practitioners of *the healing art*, and other philosophers, to this subject. It is for them to inform us by what domestic *American* substitutes we can, in our various climates, most beneficially exclude the poison of any particular foreign liquor. The *medicated* porter of Great-Britain, as our physicians can demonstrate, is far less wholesome than the pure extracts of hops and grain, which compose the whole tribe of *our* beers. Foreign liquors are often adulterated. The abundance of our ingredients of raw materials exempt us from the temptation to sophisticate the American drinks. A method to give a body to our *fermented* liquors, after the manner of the Madeira and Sherry wines, which will enable us to keep them sound in ullage casks and in uncorked bottles, is worthy of the consideration of the learned, able, and patriotic chemist.

HEMP.

EVERY movement of the belligerents is calculated to force the United States into the manufacture of their own supplies. The blockade of Elsinour and Sweden by the British government, the acts of the Danes, and of the Swedes in Pomerania, oblige us to find substitutes for the cordage, linens, steel, and iron, which we have heretofore drawn from the numerous ports of the Baltic. We have imported in a single year 6,500 tons of hemp, and 210 tons of cordage and cables, besides vast quantities of hempen drilling, sheeting, duck, and other linens. The mere unmanufactured hemp for these goods, at the present price of 400 dollars per ton, is worth in our markets two millions eight hundred thousand dollars, and weighs nearly fifteen millions of pounds. Our planters must supply the place, by American hemp, flax and cotton, of the sheetings, drillings, ravens duck, sail cloth, table cloths, and towels, which we procured from the Baltic. All those goods can be made also of flax; and they, as well as twine, cables, and cordage, can be well made of hemp. It will be our interest to cultivate more flax and hemp, and much less tobacco. A small quantity of this latter plant is consumed by our army and navy; but flax and hemp are necessary for the public supply, military and naval. The modification of our agriculture, so as to suit our own manufacturing purchasers, is necessary to the profit of our cultivators, and to the certainty and sufficiency of the public supplies on sea and land. The rich swamps in the eastern counties of North-Carolina and Virginia, and great quantities of the better class of lands in the western states, are well adapted to the production of hemp: and it is plain, that the linen manufacturers of middle and western Pennsylvania, and other places, could readily execute, by close imitations, linens like the best we receive from Russia. Twine, hempen yarns, white rope, and tarred cordage and cables, are extensively made on the Ohio and the Mississippi. All these sustain the expenses of transportation better than the less valuable raw materials of which they are made. The rival foreign articles sustain the transportation of the raw

and will add to our list of goods made from cotton. In no branch will these goods be more frequent, more easy, or more useful, than in that which furnishes substitutes for goods of foreign hemp and flax. It is conceived, for example, that one fiftieth part of our ordinary cotton crop would make as much American twilled cotton drilling (in lieu of the hempen drilling, ravens duck and sheetings of Russia) as would furnish two summer suits for each man of an army of one hundred and fifty thousand men. Considering the redundance and steady increase of our cotton, and the numerous substitutes for foreign goods, which may be made of it, too frequent occasion cannot be taken to notice its applicability to old and new uses. When we remember, that cotton is much more easy and less costly to raise or procure than flax, hemp, wool, silk, or leather, we cannot doubt, that it will fall in price, till the cheapest cotton shall be as low as the cheapest of those materials. To increase our cotton manufactures, and either to duty or to banish those of the countries beyond the Cape of Good Hope, *which are never made of our cotton*, would obviously be to encourage and support the American agriculture. Upon the whole subject of this paper, as it relates to public supplies and those for private use, it behoves us ingeniously and deliberately to consider the most easy, prompt, effectual and profitable modes of procuring, through the means of our various raw materials, substitutes for the hemp and flax, and the hempen and flaxen goods, of which foreign cupidity and usurpation are likely to deprive us by orders and decrees, or captures and seizures. The illegitimate conduct of the belligerent powers has happily placed our manufactures, as it were, in a hot-bed.

The obvious tendency of the present systems of the belligerent powers is:—

1st. To decrease or rather to destroy the profits of the agriculture and land of the United States, by preventing the sales of our produce in some foreign countries, and by loading those sales with various heavy and debasing charges in other foreign countries.

2dly. To enhance the cost of American supplies by preventing their transportation hither from some countries, and by in-

creasing the charges, equally heavy and debasing, of the transportation from others.

The natural efforts of the American capitalists (both in land and in money) and of our manufacturers, and even of our circumscribed merchants, are to buy, raise and manufacture American produce and consumable articles.

No production of the United States has sustained a happier impulse than

WOOL.

THE fine cloths of England are advanced more than one hundred per cent. upon the prices of 1790. Those of France and Holland are prohibited by English usurpation, and those of Britain by French usurpation. The manufacture of cloth in Spain is destroyed or suspended. The Merino sheep are straying through the world, to us and all nations. In England they were sold in the year 1790, at the most excessive prices : even 800l. and 1000l. sterling, have been paid there for the use of a single breeder for *a single year*.* In America, they have been procurable on various terms, at the highest for less than a quarter of this sterling money for the full price of the finest ram, as the momentary, occasional and highest cost of the animal. The carding of wool has become an operation of the utmost facility, by water, cattle, or steam. The spinning is done by water, horse and steam. Steam engines have been introduced, improved and rendered familiar. The manufactory of cloths in private families has been much improved. Chemistry has thrown prodigious light on the art of dyeing in Europe and America. The stocking loom has been greatly improved, as also the dressing and fulling of stocking webs for hosiery, and for a new, curious, and excellent species of woollen cloth. The convulsions of Europe have driven hither every description of artist employed in the woollen manufactory. Sheepskins, formerly an offal, often left to rot, or only used to make glue, cannot now be procured in sufficient quantities for the skin-

* This refers to Bakewell, who let a ram of his breed for 12000 guineas, for one year.—EDITOR.

dressers, book-binders, wool card-makers and glovers—a great saving or rather profit to the sheep raiser, on whom the foundations of the woollen manufacture depend. The United States are intelligently bent upon the increase of sheep, as well the *heavy* fleeced sheep, as the *fine* fleeced sheep. Every kind of sheep is propagated, nursed, and spared to procure *fine* wool and *much* wool. The Merino and other breeds are secured, and cannot ever be lost. The mixture of our wool and our redundant cotton aids the clothing manufacture. The two branches work well together—a great and peculiar advantage in the clothing business of the United States. The women, as before observed, weave in many parts of America, and may be happily taught to weave in all the states. The increase of manufactures gives women full, safe and profitable employments, which formerly they had not. It is estimated by the Secretary of the Treasury, that our family manufactures exceed in value *forty* millions of dollars per annum, in the woollen, flaxen, and cotton branches alone. It is plain and certain then, that our army, navy and militia, in any possible war, could be supplied with clothing, far below the high costs of the late revolutionary war. The importance of our clothing manufactures is manifest and great. Their increase is rapid and incessant. The household branches alone, at forty millions, are worth double the value of all our exports at the adoption of our present blessed union and constitution. All our ordinary stock of wool is consumed in manufactures, and all we can procure by our import trade, and by all the foreign breeds of sheep. The great efforts of the farmers, to *procure wool*, do not keep pace with the increasing demand, though none is exported, and hence the prices of wool are kept up and for the best payments. Such are the new advantages of the American woollen manufacture. Shall we then continue to raise tobacco, to be dutied, plundered, rejected, restricted or excluded, according to their criminal will, by foreign governments, or shall we decrease it and raise more sheep, procure more and better wool, and provide a market at home, free from injury, insult and vexation, by the industry of our women and children, and the power of machinery, with a little aid from regular and skilful male manufacturers? Is it better to get from

45 to 150 cents per lb. for wool at a *sure* American market, or to raise tobacco to be plundered, dutied or driven from port to port, in distant seas? Let us consider *well* the past course, the present condition, and the apparent prospect of our cultivation and sales of tobacco, and all other productions. Let us consider, on principle, whether it is not better often to avoid articles of mere foreign consumption, the sales of which must be effected under all the disgrace and evils of these times on the ocean; and to raise or extract from the earth, wool, hemp, flax, cotton, leather, iron, copper, and lead, to arm, supply and clothe our soldiers, sailors, and militia, and to provide for the raiment of our families and the furniture of our houses. Let us observe well the state of Rhode-Island. With wool, flax, hemp, and leather of her own, she demands the iron and hemp of the Baltic and of her Southern sisters, for her manufacturers, and the cotton of Virginia, the Carolinas, Georgia, and the western states for her *pre-eminent* cotton mills. In that state there are already erected a number of cotton mills to card and spin, equal to one for every township, and her enterprising merchants and cotton millers have erected others in the adjacent townships of the more wealthy and populous states of Connecticut and Massachusetts. The native country of the illustrious Greene, has already made effectual provision for the sure and cheap supply of all the cotton goods, which can be necessary for any force of army, navy and militia, which we can want in any war; and this too, *in certain support of the Southern agriculture of the United States*. The population of the whole state of Rhode-Island is less than that of the English town of Manchester. Shall we cast the eye of fellowship and attachment upon our neighbour state, or upon our foreign rivals in British Lancashire, or Gallic Rouen? Shall we consume the provisions of the agricultural states by the cotton manufacturers in Rhode-Island and its vicinity, subject to the light expense of a coasting voyage, or shall we send them to Liverpool or Rouen, for foreign cotton spinners, under heavy charges and more intolerable indignities? Let us use the *home* market, since the roads to the foreign are blockaded, or subjected to a scandalous tribute.

SKINS.

THERE is no class of manufactures more important and necessary to the cheap and effectual supply of the public force in any possible war, than those, which are made from the hides and skins, of the farmer's animals, and from those of the beasts of the chase. Shoes, boots, guetres, stocks, cockades, straps, belts, scabbards, cartouch boxes, saddles, bridles, holsters, valaises, bags, caps, gunslings, harness and geers, leathern breeches, and even vests, ship pump leather, rigging hides, and some other articles, are made in the best forms by our various leather manufacturers of American and foreign hides and skins, tanned, tawed, coloured, or in the hair, as the case requires. To these may be added, for general use, trunks, portmanteaus, saddle bags, carriage boots and tops, gloves, pocket-books and portfolios, card-faces, book covers, parchment, sham-morocco, and many other things to a great amount. It is stated in the report of the Secretary of the Treasury, that all our leathern manufactures may be estimated to be worth per annum twenty millions of dollars---a very moderate estimation. Those of England are computed at more than ten millions sterling, or forty-four millions of dollars. A large part of the difference is occasioned by the cheapness of the American skins, leather and manufactures. In proportion to our population, the quantity of the leather goods in America is not materially less than that of Great-Britain, in all the necessary and useful kinds. This great value of American manufactures from hides and skins is highly useful to the country, in public and private supplies, and it is very beneficial to the landholders and cultivators in the sure and steady market it affords for skins, lime, bark, building materials, draught cattle, and the food of the men and beasts employed in the business. We do not stand in need of any foreign purchasers for our skins: nor for our bark and lime, so far as the leather branch demands them. In every instance, the American manufacturers support the American farmers, by purchasing the skins of their sheep, hogs, horses and horned cattle. These skins are converted, as we have observed, into shoes,

boots, saddles, shiphides, and other necessities and requisites for the comfort and service of the defenders of our country, by land and sea. A copious, sure, and excellent mass of *war supplies* is thus secured for ever to our country, and this too, at the expense of those foreign nations, who formerly furnished them, and who have intrenched upon our personal and public rights and interests on the high seas. Those who in a phrenzy of avarice, have *temporarily* suspended our commerce, have, by that very measure, *permanently* established our *adult* manufactures. Our leathern manufactures alone, are at this moment worth much more per annum than were all our exports in the first year under our present national constitution. Peace in Europe will restore our commerce, but nothing can deprive us of our established manufactures. They have passed the infantine state. They are now *adult*. They have grown naturally and unforced, out of our own lands, our own waters, our own woods, and our own wants. The presence of those raw materials, which cultivation, fishing, hunting, mining, or our various soils spontaneously produced, have occasioned the manufacture of those plain, good and useful commodities, which are necessary to righteous defence, and to the wants and comforts of civilized man.

In regard to the leathern branch, it may be useful particularly to suggest to the citizens of our western states and territories, of Pittsburgh, Erie, and the towns on the Ontario, that they owe to their country and themselves more reflection and exertion on the subject of the skins of all the wild animals. The deer skin, for example, often perishes in its way from the western forests to the Atlantic warehouses; and frequently, nay generally sustains an expense of transportation too heavy for its low *unmanufactured* value. Every mode therefore of preparing, dressing and employing deer skins in our western and remote settlements, should be carefully devised, considered and executed. They are susceptible of being well tanned. Lime, bark, and tanner's streams, with cheap grounds, present themselves in abundance in all the villages, townships, and counties adjacent to the Indian country. Well prepared deer skins, tanned, tawed, and buffed, or in russet, or in black, are fit for many common purposes, and for military

supply. Very large quantities are sent, dried only in the hair, at a ruinous expense of transportation, from our remotest wilds to the distant manufactories of transatlantic Europe. This subject is worthy of the utmost attention of the Indian trader, and of the Western merchant; of the manufacturers of leather, and of their monied friends in our frontier states and districts. Any considerable improvement, in regard to the manufacture and employment of deer skins, would be of great importance to the supply of military leather, and of course to the operations and maintenance of our army in our young settlements, and in the scenes adjacent, in any possible Indian war.

The more general preservation and dressing of the skins of hogs, (the best leather for the seats of military saddles) would be attended with good effects upon our public and private supplies. In the Eastern states more of the due attention is paid to this object; but it is really neglected in some intelligent and economical quarters. Since the usual supplies of foreign hides and skins is not at present received, and since war might interrupt their importation, the beneficial consequences of present attention to the skins of hogs, of deer and other animals, now in some measure neglected, merit consideration, as it would give comfort and effect to our forces, and economy to our military expenditures. The enhancement of the price, value or demand for all Indian skins, would render our intercourse with them more profitable, and of course, more inducive of peace. Our rival neighbours cannot employ the savage hunter's furs and skins, in manufactures and consumption, on this side of the Atlantic. They cannot, therefore, in this respect, as well as the Americans, tempt our red neighbours into the paths of friendship, by the benefits of trade. Thus we perceive, that while our unforced and naturally growing manufactures give us cheap and sure military supplies, with a view to our white rivals and foes, they diminish our occasion for those costly objects in respect to the conciliated Indians. It is well, in the hour of necessity, to be able to procure cheap supplies; but it is better thus to remain in peace with our savage neighbours, and, in consequence, to be exempted from the burden of the purchase.

When any branch of American manufactures has obtained maturity, elegance and beauty, as is really the case of our leathern commodities, open and covert exportations naturally take place. Our rivals, in the field of trade and manufactures, bring upon themselves the great new evil of our powerful competition. In most useful things of leather, for example, in the South American markets, we can by price and quality effectually supplant the European manufacturers, especially since the foreign orders and decrees have driven our monied capitals from our ships to our workshops. So Britain may furnish them for a time with the lighter cottons, for the luxurious and the fashionable few, but we shall supply them with the heavy and substantial commodities, required by their plainer and their poorer millions.

IRON AND LEAD.

THE progress of our iron manufactures has been so great, that to the productions of our mines, furnaces, and forges, the predatory character and conduct of most of the foreign navies is no injury. The home market, which our artizans create for unmanufactured iron, enables the landholder and iron master to look, with commiseration or contempt, upon the scandalous naval degraders of the regular governments of Europe.

But the benefits resulting from our iron manufactures do not stop here. Regular and approved *fire arms* are annually made in the United States to an amount sufficient to equip an army three times as large as the greatest, which Britain had on this continent in the war of the revolution. Besides these, many rifles, pistols and swords are manufactured, and many cannon, shells and balls are cast at our foundaries. The aggregate of our iron wares is estimated, in the treasury report, at 15 millions. Thus it is, that manufactures afford at once a sure and great supporting market for the spontaneous metallic productions of the earth, and provide us with the best instruments to defend our much injured rights. Will any faithful and considerate American consent to destroy these precious military manufactures, the want of which was so solemnly felt in the year 1775? Will he strike this im-

mense and precious item of 15 millions out of the account of our warlike resources?

In like manner, the discovery of lead mines, and the purchase of Louisiana, have given us a very considerable quantity of that convenient and necessary metal: it is not all nearly sufficient to supply the home market suddenly created by our own manufacturers of that material. Thus again do our numerous artizans exempt us from the necessity of sending our lead, *through injuries and insults*, to European markets, furnishing us at the same time with every description of the leaden means of public defence.

In this manner also, the manufacturers of copper, zink, brass, and pewter, minister to our prosperity, and to the safety of our country.

The endless variety of our metallic manufactures, directly or indirectly for the use of the army, the navy, the militia, the hospitals and the laboratories, is well known to every man of information in the United States. We have arrived at such a point of skill, that it may be correctly affirmed, that there is scarcely a metallic requisite or convenience, which our workmen could not make, at no extravagant price. Many of these things are lower than the cost and charges of importation, and others are cheaper than their prices in Europe. Of this class is a long and valuable list of hollow wares, the shapes of which subject them to accidents and to an insupportable freight. So great and so sure is the market for American metals, created by our manufacturers, and so immense is the mass of their supplies *for the public service*, and for individuals, that they require the importation of at least ten thousand tons of foreign iron, steel, copper, zink, tin, lead, brass and pewter in every year. The trip or tilt hammer, the rolling, slitting, boring, grinding and polishing mill, and the nail manufactory, and several others, proceeding by water, horse or steam, are means of exempting agriculture from the loss of its labourers, which the docile artists of the United States have learned, from Europe or their own mechanicians, diligently to employ. The little Naiades, and not Hercules, are put, in these curious times, not only to the distaff, but to the powerful roller and the ponderous sledge.

Let it be well remembered then, that the numerous host of metal manufacturers in the United States, not only consume the whole production of our various mines, in preparing for us every description of useful and necessary commodity to which metals are convertible, but that they demand, through our merchants, from the landed interest of foreign countries ten thousand tons of metals. Be it then the steady and active endeavour of the American land-holder to supply their wants, and to supplant this rivalry of distant nations. Manufactures, at least when unforced, if rightly understood, enable united America to be more prosperous in peace and *much more secure in war*. The awful want of military supplies, which marked the revolutionary contest, is no more. The manufacturers of America, working on the spontaneous productions of our own soil, or on the fruits of its cultivation, and sometimes also on the imports of the enterprising merchant, have terminated for ever all the evils of a scanty, dear, and precarious military supply.

WOOD.

THERE is no branch of American manufactures more interesting to agriculture and to the public defence, than that of the workers on *wood*. It is computed at twenty millions of dollars per annum by the Secretary of the Treasury, and, as it is believed, without the smallest exaggeration. The list of *military* manufactures of wood is long and important. Some of them are as follow : The hulls, masts, spars, blocks, anchor stocks, boats, &c. of public and private vessels of war ; oars and sweeps ; handspikes ; gun-carriages and waggons ; tomkins ; pistol and gunstocks ; sword-handles ; blocks of cartouch boxes ; canteens ; budge-barrels ; jackscrew stocks ; grape-shot stocks ; packing, liquor and water casks ; mill work for military manufactures, &c. &c.

On the important manufactures of *wood* depends in a degree the whole business of the clearing and cultivation of the earth by ploughs, hoes, spades, shovels, axes, rakes, forks, scythes, sickles, &c. which are all stocked or handled with wood. The whole business of transportation within the country by boats, shallops,

and carriages ; and the whole business of the conveyance of our produce and our supplies to and from the several states and foreign markets, also depend on our manufactures of wood. Without this class of manufactures then, our lands would remain in a state of nature, our grain would be unreaped, unfanned, uncleanned, unground, unpacked, and unmoved from our farms to our grain ports, and from thence to our other ports, or those of foreign nations. So of our other crops. Our vast manufacture of pot and pearl ashes, so important to our own arts and trades, and so valuable an article of our exports, belong to the wood branch. Our packing casks, cases and boxes for dry and liquid commodities, and our workmen's vats amount to millions in number ; and without these agriculture would languish. Even the produce of foreign countries is brought to us in boxes and casks made out of our own boards, heading, staves and hoops. Not only the handles of all the instruments of husbandry, defence and navigation, are made by ourselves of wood, but those of the tools and implements of the useful and necessary arts and manufactures. A vast proportion of the wood and timber is the growth of our own lands. We are not willing to depend for gunstocks, sword-handles, carriage blocks, gun-carriages, privateers and ships of war, on foreign manufactures and transatlantic forests. We are rather disposed to embrace, as all important to the prosperity of the land-holder and the public defence, our ship builders, carriage makers, mill-wrights, saw millers, carpenters, wood turners, coopers and gun-stockers.

RECAPITULATION.

SUCH then is the actual condition of the manufactures of the United States, which are made of the principal productions of our land and labour.

The sketches, which have been submitted to the public consideration in these papers, may serve to manifest the real and growing importance of the *American manufacturing purchasers* to the landed interest, and to the supplies of the army, the navy, the militia, and the public and private ships of war. It may be use-

ful here to offer a recapitulation of our manufactures, as they have been estimated by Mr. Gallatin, in his official report of the 17th of April, 1810.

They are as follow :—

Manufactures of wood, as the material	- - -	\$ 20,000,000
do. of leather, as ditto	- - -	20,000,000
do. of soap and tallow candles.	- - -	8,000,000
do. of Spermaceti oil and candles	- - -	300,000
do. of refined sugar	- - -	1,000,000
do. of household manufactures of cotton, flax and wool	} - - -	40,000,000
do. of fur and wool hats	- - -	10,000,000
do. of spirituous and malt liquors exclusive of cider	- - -	10,000,000
do. of iron 15,000,000 to	- - -	12,000,000

\$ 121,300,000

do. of paper, paste-boards, printing and book binding.

do. of hemp.

do. of cotton, wool and flax, not made in families.

do. of seeds, oils and glue.

do. of copper, brass and pewter.

do. of lead, including painter's colours.

do. of tin, japanned and plated wares.

do. of gunpowder.

do. of starch, hair powder and wafers.

do. of earthen ware and glass.

do. of salt and refined salt petre.

do. of chemical preparations.

do. of straw and chip bonnets and hats.

do. of calicoes printed, &c. &c.

The value of these is not estimated, but is undoubtedly very considerable.

When it is remembered, that in the first year of our present beneficial and inestimable union, under the existing constitution of the United States, we did not export foreign and domestic

merchandize to the amount of 20 millions of dollars, we cannot but rejoice in so grand an exhibition of American manufactures, as is above stated. If the fourteen items not carried out, could have been correctly estimated and added to the nine preceding, our whole exports, in the most favourable year, would appear very far inferior. Those exports are fluctuating, and much too dependant upon foreign justice and friendship. It is a part of the object of these papers respectfully to demonstrate, that our *actual* advance to a manufacturing system of 120 to 150 millions of dollars, has given us *a great and sure home market* for the greater part of our produce, exempting our crops from foreign plunder and an odious taxation; and a copious source of military and private supplies, free from spoliation and a scandalous tribute.

Having thus rapidly advanced in the business of American manufactures, *and being in real want of raw materials for every branch* except that of cotton, it is plainly our interest to pursue, as Rhode-Island has done, the cotton manufacture; to lessen the cultivation of tobacco, and perhaps of cotton, to raise madder, woad, and other dye-stuffs, and more wool, flax and hemp, and to draw forth our coal, clays, lead, iron, copper, tin and zinc, from the teeming earth. In the six years of sickly and inert peace, which preceded the auspicious birth of our present federal system, we imported soap and candles, cables and cordage, refined sugar, much of the most simple and necessary leather manufactures, hats, beer, ale and porter, cider and perry, wares of the common and precious metals, cabinet work, carriages, implements of husbandry, nails and spikes, and various other articles, which have either vanished from the list of our imports, or have been greatly diminished, in proportion to our consumption. The duties imposed for the public revenue and service, the freight, insurance, commissions, and other charges of exportation from Europe, and of importation here, have yielded, in effect, *a sure and substantial protection* to the American manufacturers. As to all the states north of the *cotton country* of United America, this real, very great, and indefeasible protecting advantage has occasioned *all* their raw materials to be manufactured within ourselves. This is clearly proved by our large im-

portations of iron* and steel, lead,* copper, zinc, block tin, pewter, brass, flax, hemp,* hides and skins, madder, and all the wool we can procure. Not only do the middle and northern sections of the United States manufacture *all their own raw materials*, but they have so fully entered into the domestic and mill manufactory of our southern and western cotton, that almost every retail store in the ten middle and northern or eastern states, effects, in every year, *more sales of cotton than of wool, flax and hemp*, and the state and vicinity of Rhode-Island exhibit a water spinning cotton mill, in or for every township. The presence then, of this *only redundant* American and southern raw material, has produced these pleasing and successful exertions in this interesting manufacture, amounting already to one third of the whole value of the foreign manufactures imported into the United States, in the first year of the present constitution; though the district, which includes these eastern cotton mills, does not exceed a little oblong of sixty miles by forty at the utmost. The population of that leading district of the cotton water mills, is not one thirtieth part of the ten middle and northern states. The present stable footing of our cotton manufacture, and its rapid progress in profit and perfection, cannot be doubted. The deep interest of the *southern* cultivators in our extensive and diversified manufacturing operations has become manifest. The vast and certain aid of those operations to public, military, and naval supply, are equally obvious, and incomparably more important, even in times of peace. But incalculable is their value in this solemn crisis of human affairs, when all the sons of Columbia are admonished, by the armament of every other nation, to adorn their houses and fill their magazines with conveniencies and necessities, *for the sudden and effectual exertion of the whole public force, in defence of our altars and our homes.*

* Of iron and steel,	£.22,000,00
Of lead,	5,500,000
And of hemp and flax,	15,000,000
Are imported, being	£.42,500,000

ON THE UTILITY OF THERMOMETRICAL OBSERVATIONS AT SEA.

THE subject of the importance of an accurate knowledge of the temperature of the water at sea, to navigators, was discussed by the Editor in another publication :* an extract from the work by Col. Williams, was there given, with some original facts, to confirm his theory, and to shew the advantages which had actually resulted from an attendance to it : notice was also taken of the loss that had recently happened of the Lady Hobart packet, in July, 1803, by running against an island of ice. The facts detailed by Mr. Masson are very pointed, and ought to dispel any doubts in the minds of those who could hesitate assenting to the truth of the theory of Col. W. Science has seldom been applied more beneficially to forwarding the business of mankind, than in the present instance, and every navigator ought to be under lasting obligations to Col. Williams, for the knowledge of the means of securing their safety at times when the compass, the log, or the quadrant, nay, their organs of vision, avail them nothing.—EDITOR.

Extract of a letter from Francis D. Masson, Esq. to Cpl. Jonathan Williams, Commandant of the corps of Engineers, and Author of "Thermometrical Navigation," at New-York, dated

"CLIFTON, (*Eng.*) 20th June, 1810.

"MY voyage from New-York to Halifax, in the British Packet *Eliza*, was so very tempestuous and unfortunate (having carried away our foremast,) that I did not make any thermometrical observations ; but when we sailed from Halifax, on the 27th of April, I began them, and continued till I unfortunately broke both my Thermometers. However short the time was, you will perceive that my observations have been very important, and I herewith send the result of them. You will perceive with what fidelity the Thermometer indicated the Banks, and the approximation towards Islands of Ice. The Captain was so convinced of the usefulness of the Thermometer, that he made regular remarks, and inserted them in his journal. I gave him one of your books, thinking it would be pleasing to you that I should extend the knowledge of a discovery so useful as yours, and I wish it were more generally known. After having miraculously escaped the Islands of Ice and several severe gales, we arrived at Falmouth on the 22d of May, 1810."

* Dom. Ency. article Thermometer.

A THERMOMETRICAL JOURNAL

FROM HALIFAX TOWARDS FALMOUTH, IN THE BRITISH PACKET ELIZA.

Dates.	Hours.		Heat of		Latitude N.	Longitude W.	REMARKS.
	A. M.	P. M.	Air.	Wa.			
April 26	10		44° 1 47 4 43 8 46	40° 41 42 40	43° 30'	62° 52'	Sable Bank.
29	8		45	43			
	Noon		49 5 50 7 48 10 48	48 62 64 54	42 27	60 54	
30	9		58 60 5 58 9 60	62 61 61 60	42	1 59 21	Tacking tow'ds edge of stream Steering in the stream.
	Noon		60 58 60 60	61 61 60 60			
May 1	8		60	58			Sound in 70 fath. no bottom; the water at that depth 2 deg. warmer than at the surface.
	11		60 2 64 3 62	46 62 46	41 53	56 52	
			4 58 5 60 6 57 8 56	47 47 45 43			An Island of Ice, bearing S. S. E. 7 miles. Abreast of ice 1-4 mile to leeward. Island of Ice bearing S.S.W. 7 miles.
2	1		58	50			
	3		60	60			Sound with 70 fath. no bottom.
	8		60	62			
	10		63	63			Sound with 80 fath. no bottom. Sound with 80 fath. no bottom. An Island of Ice abreast 100 yds. This was about 150 ft. high, and 1 mile in dia- meter. When first discovered, it was not 100 yds. from the vessel, and we were sail- ing directly towards it. The obscurity was then so great, that at that distance it appeared only like a white cloud ex- tending from the sea over our masts.
	Noon		64 3 61 6 62 9 56 12 50	63 64 58 56 56	41 25	53 8	
3	4		43	43			Passed several Islands of Ice, the largest bearing S. W. 7 miles.
	6		40	39			
	8		41	44			No bottom by 80 fathoms.
	10		43	43			
	Noon		44 4 44 6 46	43 50 60	42	1 50	Broke the Thermometer.
4	Midn't.	12	46 4 46 8 43	60 52 60			
	Noon		55 3 49 12 48	59 60 60	42 54	46 2	
5	6		47	59			
	Noon		53	59	43 12	41 43	

REMARKS ON THE FOREGOING JOURNAL.

N. B. THE important point of comparison, is the difference in the *heat of the water in different places*, in or near the stream, in the ocean, out of the stream, on the coast, and near Islands of Ice; not the difference between *the heat of the water and the air*, as some have imagined. This latter is merely a concurrent observation; it serves to account for ordinary changes, and thereby to guide the judgment.

From April 28, at 10 A. M. to April 29, at 8 A. M. we see the temperature of the sea in the shoals of Sable, from 40 to 43. At 5 P. M. we see the warm influence of the Gulph Stream from 62° to 64°. At 10 P. M. we see the temperature between the influence of the stream in deep water, and the coast, at 54°, which is about a mean between the two—then standing off shore, at 9 the next morning (30th) we see the warm influence of the stream again.

If these stripes of water had been distinguished by the colors of white, red and blue, could they be more distinctly discoverable than they are by the constant use of the Thermometer?

About 23 hours afterwards (May 1, at 8 A. M.) we find the water cooling, and in 3 hours more the mercury falls 14 degrees (46°.) Here no bottom could be found by the lead, and there was probably an Island of Ice obscured by fog. (Let it be remembered, that the coldness of ice condenses the atmosphere, and of course the consequence must be fog.) Passing this at 2 P. M. the Thermometer rose to 54°, but in one hour more it fell to 46 again, and an Island of Ice appeared at the distance of *seven miles*. Let navigators reflect on this, and say that a sudden fall of 6° in this part of the ocean, ought to induce them to haul to the southward, and keep a good look out. From May 1, at 11 A. M. we see the gradual changes as the ship passes the ice and comes again into ocean water (50°); but in two hours more, the ship is in the warm influence of the stream again, and the mercury rises 10 degrees (60°.) She proceeds in a nearly regular degree of heat during 17 hours, till at 6 P. M. the water begins

again to cool, falling to 56° at midnight. Here was no bottom in 80 fathoms. May 3d, at 4 P. M. the water was at 43° , still no bottom in 80 fathoms. Now, from past experience, we must say, here is an Island of Ice in a *less* distance than *seven miles*, because at that distance the water was at 46° . When day appears, behold an enormous Island of Ice abreast 100 yards, and the heat of the water reduced to 39° ! A question now occurs,—Had not the Thermometer been thus used, had it not been continued during the night, what would have been the fate of this ship?—Let the recollection of the miserable fate of the ship Jupiter, be an impressive answer; and let it be laid down as a maritime axiom, that want of caution, or ignorance, can alone cause such accidents in future.

JONA. WILLIAMS.

ON COCHINEAL.

By EDWARD CUTBUSH, M. D. *Philadelphia.*

THE colouring of cloth and other articles of dress, is not in itself an object of necessity; but custom having introduced the use of clothing of various tints, from the *plain drab* to the *Tyrian purple*, it becomes important to the manufacturer and dyer, to procure their colouring matters with facility, and at a moderate price. As the *cochineal* insect furnishes a colour, which is frequently used by dyers, either alone or combined with other articles, it may not be improper to call the attention of the planters of the southern states, to the propagation of the insect, and the cultivation of the plant on which it feeds, and from which it derives its importance in commerce. By attention, a sufficient quantity of this article might be propagated in many parts of the Louisiana Territory, South-Carolina and Georgia, to supply the immediate wants of the manufacturers in the middle and eastern states; and, in the course of a few years, it would become an

important article of exportation to foreign markets. The Spaniards, until a few years since, enjoyed, almost exclusively, this lucrative branch of trade, when the attention of the English East-India Company was attracted by Dr. Anderson, physician-general at Madras, who conceived that he had discovered the true *cochineal insect* in the environs of that place, which, however, on being sent to London, and submitted to the test of experiment by Sir Joseph Banks, proved to be very different from the Spanish grain. Dr. A. being disappointed in his expectations, by perseverante succeeded in procuring the *Coccus Cacti* (Cochineal insect) from South-America, with the favourite plant on which it feeds, (being the *Opuntia*, Nopal, or prickly Pear, the fruit of which is a beautiful crimson) and established a Nopalry at the expense of the Company, where the insects were propagated with success for several years.* It is astonishing that these little insects should have been the source of so much speculation and jealousy, on the part of the Spaniards, as to induce them to keep their propagation and culture a secret for 260 years, and to have amused the learned world with the description of the Silvester for the genuine Cochineal. In 1736 no less a quantity than 880,000 lbs. were imported into Europe; and the imports into Great-Britain alone, during the years 1783, 4, 5, and 6, amounted to 1,154,590 lbs.; the presumption is, that the quantity annually increases; it therefore becomes an object worthy the attention of our southern brethren. Europe has paid to Spanish America upwards of half a million sterling per annum for this article; which, in point of value, in some places, has been considered next in rank to gold and silver. A wild species of this insect is found in several parts of South-America, which is called Silvester, but the Spaniards and Mexicans only, are said to have the true cultivated species, which yields the fine colour so much admired; this is owing, in all probability, to a selection having been made of *Opuntia* for their Nopalries, which yields fruit of a crimson colour: perhaps, if the Silvester or wild spe-

* Monsieur Thierry de Menonville also propagated them with success in the French Colony of St. Domingo, previous to the year 1780.

cies of insect, were confined to this species of *Opuntia* for their subsistence, their colour would equal that of the cultivated or *grana fina*; this, however, is merely my conjecture.*

There are many species of Cacti usually described by botanical writers; that which bears the name of *Cactus Cochinifer* should be selected for a Nopalry. "Of the *Opuntia* or prickly Pear," says Wynne, "there are different species in EAST-FLO-
RIDA; on one sort, with a smooth leaf, the *Cochineal* is found in incredible plenty; of the fruit of the other species is made a vegetable *Cochineal*, which may be used for ordinary purposes instead of the true *Cochineal*."† In Mexico these insects are nursed with great care. The *Coccus naturally* fixes on the leaves and stems of various plants. The Indians gather them, put ten or twelve into little beds made of moss or the flue of *Coco*; after which, they hang them upon the thorns of the plant known under the various names of *Raquette*, *Cardassia*, *Indian Fig-tree*, *Opuntia*, and *Nopals*: great quantities of this plant are cultivated in the vicinity of their habitations. The insect gives birth to myriads of young ones; they disperse, feed on the juice of the plant, and there produce a fresh generation. When they have attained their full size, they are taken off by *scraping* the leaf; this is not so fine a quality as that which is taken off by means of pincers, because a small quantity of the epiderm of the leaf is blended with it. The Spaniards call it *Granilla*. As soon as the insects are collected, they are destroyed and dried. The method taken to effect this has a great influence on the colour and value. That which they kill by the gentle heat of ovens

* It appears that I am incorrect. It is asserted in the "*Circle des Philadelphes*," and on the basis of *experience*, that the red, yellow, violet, or white colour of the fruit of the *Cactus* or *Nopal*, produces no difference in the colour of the *Cochineal*, which are nourished upon these several species, neither do they yield more nourishment. If this information be correct, I do not see the necessity of being so particular as to the choice of those plants, intended for a Nopalry, which is inculcated in the Society's publication, entitled "*Traité de la Culture du Nopal, et de l'éducation de la Cochenelle*. St. Domingo, 1787." In this work they recommend the *Nopals* for the fine *Cochineal*, and the Spanish *Raquettes* and *Opuntia* for the *Silvester*.

† Wynne's *Hist. of North-America*, Vol. 2. p. 334.

is of an ash gray or mottled, and is called *Jaspeada*. If killed by plunging them, in baskets, into hot water, they are called *Renegrida*; these are not covered with a white powder. That which bears the name of *Nigra*, has been killed on hot plates. The *Cochineal*, *nursed upon cultivated plants*, yields a more beautiful colour, and in greater quantity than the wild.* The *Cochineal*, dried on tin or iron plates, *by the heat of the sun*, is by far the best in quality. That which is killed by hot water, is deprived of part of the colouring matter.

OF THE NOPALS.

THERE are two species of *Opuntia*, which they call *Nopals* in Mexico; one is that which the Indians name simply *Nopal*; the other is called *Nopal of Castile*. The *Nopal* is a species of *Cactus*, whose articulations are compressed; its roots are of a gray, ash colour, inclining to yellow; they become ligneous by age; they always have a perpendicular or tap-root; others horizontal; they are round, and, in the young plants, tender; in the old, ligneous. The trunk of the *Nopal* grows in the form of a tree, like the generality of *Opuntia*; the articulations are of an oblong, oval; they are from ten to eighteen inches long, by five or nine broad, and about an inch and a half thick. When the plant has developed itself, the rind of the articulations presents a smooth surface to the touch, very lightly and finely tufted on those of six months or a year old. It is of a dark green in the adult state, and a light, glossy green when young. The young sprouts are armed with one, two or three thorns, one of which is greater than the second, and the second larger than the third, when there are three; where there are two only, one is always taller than the other; their thorns are an inch or more in length, ligneous, solid, and very sharp. This distinguishes them from the *Opuntia* without thorns, such as those of *Campeachy*, the *Spanish Raquette*, and the *Nopal of Castile*; these, however, are not absolutely without thorns, but the quantity is less and more minute. These thorns are always greater, more numerous and strong on

* Vid. Barbut, sur les genres des Insectes de Linne.

the old trunks and branches ; such, for instance, as have arrived to the age of two or three years. We rarely see more than one or two short thorns on the young joints ; frequently there are none. The young sprouts, like all the other species of *Opuntia*, are always furnished with bundles of reddish bristles.

THE NOPAL OF CASTILE.

ALL that we have said on the Nopal, respecting the bristles and thorns, may be equally applied to the Nopal of Castile. Its roots and colour are the same ; like it, its form is arborescent, but *differs essentially in the trunk*. The articulations are larger, being thirty inches long by twelve or fifteen broad, and have, like the raquette, the round form of the summit, resembling very much the leaves of purslain ; they are of a vert d'eau, very clear and gay ; this colour is a species of damask, like that of the dark red prunes ; the finger removes it, on touching the articulations which are from six months to a year old, but not from the aged. The appearance of the plant is splendid. No one can describe, much less paint the liveliness and magnificence of the vegetation ; the abundance, the grandeur, and the developement of its articulations ; in a word, we know it to be the most beautiful of the *Opuntia* class. This species of Nopal does not come from Castile, as its name imports, but has been thus named for its beauty, and as a compliment to the Castilians. It appears that the Indians of Mexico cultivate this plant, more for the fruit, than for the subsistence of the cochineal insect.

The true and most essential property of the Nopal, known in Mexico, is to nourish the fine Cochineal, with more certainty, and more abundantly, than any other species of *Opuntia*. Is it the facility with which the young insects fasten their feet to the velvet surface of the rind of the true Nopal, which gives it the preference over that species of *Opuntia*, whose articulations are polished ? After all that has been said and written respecting this species of *Opuntia*, an author now before me observes, "Après six expériences consecutives, qu'il n'y a point de difference entre

la récolte de la Cochenille sur cette espèce à celle faite sur le Nopal."

There are different accounts given of the colour of the flowers of the Nopal of Castile ; whilst some say that the flowers are of a blood-red, others assert that they are purple ; but I believe that it is very generally acknowledged, that the juice of the fruit is red. The fruit, when eaten, colours the urine of a high crimson : to persons unacquainted with this effect, much anxiety has been produced, conceiving that they were attacked by some fatal disease. It produces no injury to the urinary system ; its effects cease in twenty-four hours.

NOPALRY.

A PLOT of ground set apart for the cultivation of the *Opuntia* or Nopal, is called a *Nopalry*. A Nopalry of one acre, or one and a half, is sufficiently extensive to occupy the attention of one man, during six months of the year. The ground selected for a Nopalry should be dry, and so situated, as to enjoy all the benefit of the sun's rays, and be sheltered from the most violent winds which prevail where it is established.* It should be surrounded by a wall, hedge, or fence. In the preparation of a Nopalry at Madras, Dr. Anderson recommended a piece of ground having a southern exposure, containing about two acres, which he directed to be levelled and enclosed by a bank of earth, ten feet wide at the base, three feet high, and four feet wide at the summit, leaving a slope on each side to resist heavy rains. On the top of this bank, he directed a hedge of the "Milk Hedge," (*Euphorbia Aphylla*) ; at the foot of the bank, on the inside, a ditch to be dug two feet wide, with an outlet, to prevent the ground from being overflowed. The ground, being thus prepared, was planted with Nopals about six feet apart. That species of Nopal is recommended, which is of a slender structure, with thorns so small as only to be seen by the help of a magnifying glass, as the most

* It is unnecessary to direct that the boundary of a Nopalry should be in this or that situation ; regard should be had to the climate and situation of the piece of ground ; which is intended for the Nopalry.

proper for the treatment of the Cochineal. Thierry de Menonville describes it under the name of the Nopal of Castile. Cuttings of the Nopal, containing *two articulations*, may be planted at a *convenient distance* apart, and intersected by walks to permit a person to go round the plants to examine the state of the insects. When the Indians of Guaxaca plant a Nopalry near their dwellings, they generally place in each fosse two plants, and sometimes three, each composed of two joints, that the Nopalry may be quickly prepared, and that one may supply the place of the other, in case of accidents; when they have taken root, the superfluous plants are plucked up. The Nopalry should be preserved free from weeds and grass, otherwise many insects will be lost. Should the situation of the Nopalry render it hazardous to expose the stock during the winter, it would be proper to have a *conservatory*, which should be kept moderately warm, and supplied with a sufficient quantity of the Nopals, planted in boxes or pots, for the subsistence of *a few insects* for a summer brood: this would form a convenient nursery. It is recommended to examine those insects which are about *seven weeks* old; those that appear the most forward in their gravid state should be collected, and put into bags made of pieces of thin gauze or hair cloth, of a texture sufficiently close to confine the mothers, and at the same time, room should be left to permit the young ones to escape, through the interstices, to form a new colony. These bags should be attached to the plants; or some branches, on which the young Cochineal insects are beginning to issue from their mothers, may be cut off and placed so near to a fresh plant, that the young ones may creep with ease from the branch to the plant. The young of the Cochineal insects are liable to be attacked by several species of insects, which frequently desolate whole plantations: perhaps this is the reason why Dr. Anderson recommended the hedge of Euphorbia, which is said to prevent these destroyers from entering the Nopalry.

The parade which some writers have made in their directions for the planting of the Nopals, "at an obtuse angle with the west," and "*acute angle with the east*," in "*diagonal lines to the south*," &c. gives an air of mystery to the culture of the

Nopal, which has a tendency to prevent farmers from engaging in the propagation, of the insect. Every person, who has witnessed the growth of the various species of the *Opuntia* amongst the rubbish in the vicinity of towns in warm climates, must be convinced that the plant does not require so much attention. The Nopals, however, are subject to disease ; but neither their diseases, enemies, nor accidents, can ruin a Nopalry, which is properly established and attended to ; some plants, or some of their articulations, may suffer and perish, but the injury is never so complete as that which sometimes happens to the indigo plantations. The Nopal is subject to three kinds of disease, none of which are contagious or pass from one plant to another.

1st. To putrefaction or gangrene. .

2d. To dissolution.

3d. The Gum.

All these diseases are local ; by cutting off the part which has suffered, just to the quick, we may save the remainder. The gangrene or sphacelus shows itself in the evening or day following, by a *black spot* and circular sphacelus on the surface of the articulations, more or less large and profound. If we raise this black spot, the interior substance sometimes putrefies, and the putrefaction extends and corrupts the other joints.* Scarification of the diseased part, or a total removal, is recommended ; the true Nopal of Mexico is, above all, subject to these diseases.

The dissolution is a spontaneous decomposition of the whole interior substance of the plant, whether it be some time in arriving at this state, or the sudden effect of a momentaneous cause, infinitely active. The articulations on entire branches, sometimes the trunk of the plant alone, from an apparent state of health, pass in an hour's time to a state of putrefaction : but a short period before, it was seen decked with green, and of a glossy

* May not this be owing to the removal of the plant from a state of nature, where it grows, generally, in poor ground, to *too rich a soil* ? The more man is removed from a state of nature to that of luxury, the greater is the number of diseases to which he is liable. Carbuncles, mortification, &c. &c. are frequently the consequences of luxurious living ; and why may not plants be also affected by a change from a poor to a rich soil ?

hue, but now it is changed into a sordid yellow.* The shining of the rind disappears. Probe it with a pin, the water issues in abundance; cut it with a knife, and the parenchymatous part appears putrefied; scarification to the quick or sound part is the only remedy. If the root and branches be diseased, root it out, change the earth, and replace it by another plant. The *Opuntia* of Campeachy is particularly subject to this disease. The *gum* is the third disease to which the Nopals are subject. The part swells through which the gum issues, without the substance or colour of the plant being altered; it forms a fissure an inch or more in size; a liquor oozes from it, and fixes itself in tears like a mealy opaque gum, yellow in the Nopals, and white in those of Castile. These are very subject to this disease. Perhaps the root, which is extremely vigorous, (and being too glutinous) furnishes more sustenance than what is necessary for the articulations. This sap, accumulating in the uteruli of the plant, produces an effort to discharge itself in an extraordinary way.

It has been remarked, on examining the course of the canal in which it is collected, that the discharge is somewhat white, like milk, and less fluid than the sap, which is generally clear and fluent.

Some of these observations, which I have translated from the French,† are worthy of the attention of medical men; and may, with great truth, be applied to the human system.

We are informed that rats and mice are fond of the Nopal, and that many of the beetle tribe riot on its luxuriant juices.

THE COCHINEAL INSECT.

THE ancients supposed that the Cochineal insect was the product of a plant; the word *Coccus* signifying a red colour, accord-

* Is not this like some of the diseases to which the human frame is subject in warm climates?

† *Traite de la culture du Nopal, et de l'éducation de la Cochenille dans les Colonies Françaises de l'Amérique, &c. Par M. Thiery de Menonville, Avocat en Parlement, Botaniste, &c. &c.*

Au Cap-François, Chez la veuve HERBAULT, Libraire de Monseigneur le general & du Cercle des Philadelphes.

ing to Lampride, Martial, and Pliny the elder. Many passages in the works of the latter, show that this naturalist believed in the common opinion, that the Cochineal was a grain, the production of a tree. The celebrated Linnæus retained the word *Coccus* to designate a family of insects, under the order Hemiptera, genus 9th, the character of which he gives as follows: "*Ros-trum pectorale; abdomen postice setosum. Alæ duæ erectæ masculis. Femina apteræ. Antennæ setacæ.*"

Twenty-two species of insects are arranged under this generic definition; in their number, is the *Coccus* of the *Cactus Cochilifer*. The Cochineal has been likewise named, from its resemblance to the *Coccinella*, an insect of the order Coleoptera. This name is evidently a diminutive of the word *Coccus*. The *Coccus* inhabits the *Cactus Cochilifer*. The abdomen is flat, the back hemispherical and furrowed by transverse wrinkles, which meet on the belly by a double margin, the superior of which is the least; the skin is of a dark brown. Its mouth is an awl-shaped point, which issues from the middle of the thorax; it has six very short, brown feet, and is without wings. The body of the male is longer than that of the female, of a deep red colour, covered by two wings; it has two antennæ, which are one-third longer than the body; the abdomen is terminated by two bristles or hairs, which diverge like the antennæ; it has likewise six feet, larger than those of the female; its flight is usually confined to a short space; it is called, by the Mexicans, *Grana*. This name is evidently a continuation of the old error, which assigned it a place among the vegetable productions. Two kinds of Cochineal are collected in Mexico, the *Grana Fina* and the *Silvester* or wild species.

THE SILVESTER.

THE *Silvester*, or wild Cochineal, is sometimes called *Grana Silvestra*, a name purely Spanish. This name also prevails by custom among the Indians, who believe that it naturally lives on the wild *Nopal*, and the *Tunas* of Mexico. The male and female of this insect differ from each other at different periods of

their age. The young Cochineals fix themselves on the articulations of the Nopal, and insert their rostra into the rind. Is the rostrum simply an awl-shaped point? or is it a tubulous body in the form of a trumpet?

Thirty days after the male insect is brought forth, it appears under the form of a handsome fly; its colour is of a deep red, bordering on purple, equally elegant in form, as he is brilliant in attire. He flies a short distance in quest of a female; he is not much embarrassed in making a choice; he turns around a female, accosts her, and pursues the impulse of nature. After the consummation of the union, he dies the same day, often the same hour. *Eight days* after the Cochineal has inserted its rostrum and fixed itself on a plant, the hairs on the margin of its back increase in size and frequently in number. The *white down*, with which the female insect is covered, increases with her age, and adheres firmly to the plant, which sometimes renders it difficult to remove her; a part of the downy substance will remain on the plant. The female is in a proper state for fecundation *thirty days* after her birth. The term of gestation is also *thirty days*; during the first ten days, she increases rapidly, and attains to half the size of a garden pea. The day of her accouchement, she pays the same debt of nature as the male. The insects should be placed on the plants of the Nopalry, as soon as they begin to leave their mothers, as it is impossible to transfer them from one plant to another, after they have once inserted their rostra; on which account, if the Nopal dies, the insects also die. The *Silvester* being placed on the Nopal, propagates without much care. They may be collected every two months, care being taken to leave a few on each plant to keep up the stock. The downy substance, which remains on the articulations of the Nopal, after the insects are collected, should be rubbed off with a moist cloth. By this means, the eggs and chrysalides of insects that have perished, may also be removed. It appears impossible to collect the Cochineal *Silvester* to advantage from the *Opuntia with thorns*; the most expert labourer, it is said, would not be able to collect two ounces per day, in consequence of the difficulty which the thorns present; but the same labourer would be able to collect, from the garden *Opuntia*, several pounds.

The *sowing* of Cochineal, a term used in many French and Spanish writers, is certainly an erroneous expression, which arose from the belief that the Cochineal was a vegetable grain. *Eighteen months* after a Nopalry has been planted, it is in a state for the reception and nourishment of the insects. The most settled spring month, I conceive, would be the most proper in which to commence the treatment of the Cochineal insect, in our climate. The Nopalry should therefore be planted at a period, when the plants will arrive to a proper age or time of commencing the treatment of the insect; say April, for example. If a Nopalry were planted in September or October, 1810, it would be in a proper state to receive insects in April, 1812, if no accidents should befall the plants. This is necessary, provided a large crop of insects is expected; but small plants will be sufficient to nourish a few. The female insects should be put into nests, as I have already mentioned in a former part of this essay. It is recommended to place the young insects on the plant early in the morning. Not more than two or four mothers should be placed on a Nopal of two articulations. On a Nopal composed of a hundred, two, three or four hundred may be distributed by fours in a hundred nests, or eight to fifty. Particular directions are given on this head; but it appears necessary to put as many only on each articulation as the plant can nourish. We are advised to make choice of the largest females for the nests. The nests should be suspended on the plants and exposed to the sun, that a moderate degree of heat may induce the young insects to quit them; care being also taken to consult their ease in making their escape. The first nest may be placed about a foot, or a foot and a half, from the earth.

Two months after the Cochineals have been placed on the plant, or one month after their connexion with the male, the young begin to present themselves. This is the moment when a general collection should be made, preserving a few breeders; no time is to be lost. At this period, friends, neighbours, whole families, young and old, unite to make the collection as speedily as possible; it is a day of festivity in Mexico. Each person is armed with a blunt knife, in his right hand, like that of a dressing case,

by which the insects are raised from the plant, without doing injury to either. They are caught in the left hand, and put on a plate or into a napkin, attached to the body by its four corners. A child of ten years of age can collect ten pounds per day, which, when killed and dried, shrink to three pounds and a half.

The insects are killed by putting them into baskets, of a convenient size, say two feet in diameter and one in depth, for ten pounds. Being covered with a coarse cloth, they are to be immersed in *boiling water*; and must be entirely covered. In this they may remain one, two, or three minutes; it is said that there is no danger of dissolving the insects by this method. The operator should be careful not to wound them, as those that are bruised are very difficult to dry. The water is always more or less coloured, but the loss is trifling. When they are taken out of the water, they should be spread with care on a table, or *plates of brass or tin*, and exposed to the *heat of the sun*. They will generally dry in the course of the day, provided care be taken to turn them occasionally with the hand about mid-day. Should they be not perfectly dry on the first day, they must be again exposed, until all moisture be dissipated, otherwise there will be danger of their spoiling by corruption. Ten persons may prepare two hundred pounds of Cochineal Silvester in one day, without fatigue. This method of killing and drying the *Silvester*, we are informed, is far preferable to heated plates or ovens, by which the grains are frequently burnt.

GRANA FINA, OR THE TRUE COCHINEAL.

THE difference of price between the fine Cochineal and the Silvester, indicates the superiority of the one over the other, and invites the cultivator of the Nopal to prefer it. Two Nopals of the same size, being charged with the same species, produce different quantities of Cochineal. That with the fine, always affords one-third more, in weight, than the other, charged with the Silvester. The female Cochineals bring forth young in the same manner as the Silvester, *two months* after their birth, *thirty days* after their union with the male. They appear then about

the size of a small garden pea, a little longer. The body is furrowed from the sides of the stomach and abdomen ; the back is convex and streaked by transverse wrinkles, which meet on the belly by a double margin, on which may be seen twelve small hairs or bristles in the young, but which disappear when the insect arrives at the adult state ; some only remaining at the extremity of the abdomen. The insects appear *white* at first sight, but strip them of the white powder with which they are covered, and they appear of a dark brown. They have six very small feet, almost imperceptible, buried in the wrinkles of their body ; the head or beak is situated in the breast. The young are contained in their mothers, attached, like a string of beads, to one common placenta, under the form and envelope of an egg. They generally die, under this form, if an abortion take place. The female is of the size of a pin's head ; the male is less than double this size. The young sometimes remain two or three days with the mother, suspended to her abdomen like a small bunch of grapes, or dispersed on her back or under her abdomen. Pressed by hunger, and having sufficient strength to break the umbilicus, they leave the mother, and place themselves on the Nopals. It has been said that the little Cochineals do not pass from one Nopal to another ; this, however, is incorrect, as they have been seen passing along a spider's thread in search of another plant. They fix themselves with their feet and rostrum, which they insert in the rind of the Nopal the same day, or at farthest the day following, after they leave their mothers. The rostrum being broken or distended, they perish like the Cochineal Silvester. Ten days after their birth, the females appear covered with a very white mealy substance, almost impalpable. The males at this period are indistinctly mixed with the females, but ten days after, they form cylindrical cases, by which they are defended as they grow ; in this they remain concealed until their puberty : the Silvester does the same. This case is, somewhat conical, and covered with a white powder. It is by the rostrum that they live attached to the plant. The great exterior difference between the Silvester and the fine Cochineal, which appears equally white, is, *that the fine is covered with a mealy or powdery*

substance, and the Silvester with a substance *resembling cotton*; the former is always double the size of the latter.

Twenty-five days after the birth of a female Cochineal, she casts off her dress: the male also leaves his confinement. This change is frequently at the peril of their lives, because in their movements they are liable to break their rostra, which are firmly inserted in the plant. The female, after this change, appears of a clear brown, but the day following she is again covered with a white powder, and the place which she occupies is surrounded by a white circle of the diameter of two lines: three or four days after, she is in a fit state for fecundation. The male escapes from his concealment, in his nuptial attire, as described under the head of the Silvester. The male of the fine Cochineal resembles perfectly that of the Silvester; there is no difference, except in size, which is double.

TREATMENT OF THE FINE COCHINEAL.

THERE are three things essential in the treatment of the Grana Fina or fine Cochineal:—1st. To procure the largest females of each generation for breeders. 2dly. To distribute them only on the best and most beautiful Nopals. 3dly. To preserve them, during the winter season, in a case, or, as I have mentioned in a former part of this essay, in a *conservatory*, where they may be permitted to multiply, until the season commences for placing them in the Nopalry; care, however, should be taken, that the increase be limited to the proportion of plants in the conservatory for their support. *Eight days* after the nests are placed on the plants in the Nopalry, or fifteen days at farthest, all that remain without bringing forth, should, with the nests, be removed, otherwise they will serve to invite destructive insects. The Cochineals which are dead, or have not brought forth, should be passed through boiling water, that they may dry quickly when exposed to the sun. These are not considered lost; they may be mixed with the crop and sold, as they are not deprived of their colouring matter. It is said that *two females*, placed on branches of the Nopal in a conservatory, will be suffi-

cient for a stock ; the produce of the first generation being *three hundred* ; the *second* will amount to 1,800,000 : hence the necessity of apportioning the insects, according to the number of Nopals in the conservatory. The fine Cochineals are collected at the same period, in the same manner, and undergo the same process, in the killing and drying, as the Silvester, which has already been described. The time of collecting them being a period of consequence, I will repeat, in this place, what is considered essential to produce a good crop. As soon as the females commence the important work of bringing forth their young, which is generally a day, sooner or later, than *two months* after they have been placed on the Nopals, no time should be lost in making the collection. This period should be attentively watched. If the females be permitted to *disburden themselves*, you will lose the crop ; their bodies will be *light and empty*, will possess little colour, and soon die : on the contrary, if you make the collection at the moment, when they have arrived to the full period of their gravid state, they are heavy and possess more colouring matter, every little insect or egg in the body possessing the same colouring properties as the mother ; hence much of the profits of the cultivator depend on seizing this opportunity for making a general collection.

I am indebted to the "Cercle des Philadelphes"* for the preceding interesting remarks on the culture of the Cochineal insects. It is my sincere wish that they may prove useful to those who may engage in this branch of industry in the United States.

The Opuntia, Nopal, or Prickly Pear, is not only proper for the raising of the Cochineal insects, but, according to Alvaro, Hernandez, Nunez, and others, it is considered a valuable article in the list of esculent vegetables. The fruit of the Opuntia, "Figas Moriscas," is the principal sustenance of whole families in the Island of Minorca during the month of September. The prickly shrub that bears them *grows wild* among the rocks, and is often used to make fences to the gardens.† I have seen them growing, in great luxuriance, in the vicinity of Algiers and

* Cape-François.

† Cleghorn's Minorca.

Tunis, but never met with any insects, on their articulations, which resembled the Coccus, though the climate, unquestionably, would favour their propagation. In the Island of Sicily, both the leaves and fruit are eaten; the former are roasted, the latter is brought to market in abundance, and considered by many as a great delicacy, when deprived of the rind; it is generally of a beautiful crimson. The leaves, when roasted or boiled, are also used as poultices to ill-conditioned ulcers. In one instance I was present when a Sicilian physician recommended their application, when warmed, to the right hypochondrium, in a case of diseased liver, as a discutient, but without any benefit as such, for an abscess pointed outwards a few days after the application, which was opened, to the great relief and final recovery of the patient.

Philadelphia, October 1st, 1810.

IMPROVEMENT IN SHEEP.

HAW-THORN, (near Winchester, Va.) 8th Sept. 1810.

DEAR SIR,

I HAVE received the first number of the "Archives of Useful Knowledge." I am much pleased with it's plan, and believe it will be the mean of diffusing much valuable information. Supposing that your readers will recieve, with pleasure, accounts of every attempt to develope and improve the internal resources of our country, I send you the following statement.

Two years since, a number of the farmers of Frederick county, Virginia, associated for the purpose of encouraging domestic manufactures, and improving their sheep. Their first meeting, to award premiums, was held on the 22d of May, 1809, when but one member, Mr. Richard K. Meade, exhibited lambs for the prizes. He showed a lamb that weighed 159 lb. on the hoof, and produced 9 lb. 6 oz. of wool, which had been washed on his back.

A second metting of the Society was held on the 21st of May, 1810., when the following lambs were showed :

			<i>Wt. on the hoof.</i>	<i>Fleece.</i>
Mr. David Ridgeway's lamb* (Tom Tackle)			180 lb.	9 3-4
Rich'd K. Meade's do.	-	-	156 :	9
Dr. Rob't Macky's do.*	-	-	169 :	8 1-2
Mr. Phil. Nelson's do.	-	-	160 :	8 1-2
Do. Do. do.	-	-	134 :	8 1-2

These sheep were shorn without the wool being washed on their backs ; but it was very clean.

It may be remarked, that hitherto, no kind of attention had ever been paid to the sheep of our county. Neither Mr. Ridgeway nor Dr. Macky ever raised a lamb, before last year, that was worthy of notice. But since the establishment of our Society, and since the inhabitants of our county have *felt* the policy of depending less on foreigners and more on themselves, for the comforts and necessities of life, the above improvement is already experienced in our flocks.

Mr. Ridgeway, a few weeks since, weighed a couple of *twin* lambs, at five months old. One of them weighed one hundred and fifteen, and the other one hundred and sixteen pounds. They are from his prize ram, Tom Tackle, who was permitted to go to a few ewes last fall. There can be no doubt, respecting the weights of these lambs, as they were weighed by Mr. Ridgeway and his miller, with great care ; and Mr. Ridgeway is not only a gentleman of unquestionable veracity, but also of great attention to business.

Besides the above exhibition of sheep, which certainly did great credit to their owners, ten pieces of fine woollen cloth, five pieces of fancy cotton, four pieces of fine flaxen linen, and a piece of blanketing, were shown for premiums. The expectations of the most sanguine members of our Society, were greatly exceeded by many of the above specimens. No idea had been formed, of the excellence, to which our household manufactures had been carried, in the short period of two years. And ocular

* From another account I learn, that these lambs were 1-4 Blood Barbary.

demonstration convinced the most prejudiced, of the egregious folly, of a longer dependence on foreign workshops for any article of clothing.

LAU: A. WASHINGTON,

Sec'ry to the above Society.

Dr. JAMES MEASE.

ON DISTILLING

APPLE AND PEACH BRANDY.

BY JOSEPH COOPER.

COOPER'S POINT, 22d Oct. 1810.

THE great plenty of fruit the present year, and the bad quality of the spirit distilled from it, in the common way, induce me to communicate some observations on that subject.

The first evil is, running it too long in the first 'stilling, which, beside injuring the spirit, will not pay for the time lost, and wood consumed thereby. The second and most injurious is, in rectifying, or second 'stilling; the running it too long, or till the spirit has an ill or disagreeable flavour, which greatly injures the whole that it is mixed with. The third is, want of care to put the liquor into clean casks: the contents of one musty or offensive one, will spoil the spirit of ten times its quantity, if mixed with it. From the experience of more than sixty years practice in distillation, I find it best to shift the receiver as soon as the spirit runs as low as first proof, and to keep the remainder to 'still with the low wines, or till there is a sufficient quantity to fill the still, with the addition of about one third water, which will imbibe much of the ill flavour, and leave the spirit more pure. But to make apple brandy to put into wine, or for other particular purposes, I would recommend filling the still half or two thirds full of good spirit; then to fill it to a proper degree with water, run it so long as the flavour is good, and treat the remainder as before. This operation I call washing; and apple brandy, thus prepared, is preferable, for putting into wine or

cider, to any other spirit whatever ; and, for common use, I have been in the practice of reducing high proof spirit with the last running from a cheese of good cider, or water cider, put in previously to the fermentation of the cider. That process will greatly improve the quality of the spirit, especially for mixing with water, and make it more mild to the taste in one week, than a year's age will when managed in the common way. A further improvement may be made in apple brandy, by putting in the still, when rectifying, two, three, or more pounds of sassafras root in what will make a barrel of proof spirit : a sufficient quantity of sassafras will give it the flavour of peach brandy, and in my opinion, if reduced as above, will make it full as good.

Although many persons are opposed to the distillation of cider, from religious principles, it appears to me that spirit is really necessary in many cases ; and apple brandy, managed as above, and kept to a proper age, is as agreeable and more wholesome than what is generally procured, at great expense and risque, from other countries. Early-made cider, and that from rotten apples, is unfit for other purposes.

JOSEPH COOPER.

LUXURIANT NATIVE GRAPE VINE,

AND ON WINE MAKING.

IN the year 1777, Joseph Cooper, Esq. of New-Jersey, noticed a native grape vine* in his neighbourhood, that covered a red cedar tree, so as to have the benefit of both sun and air, and the fruit on the south and south-west parts being unusually fine, and ripening early, he was induced to plant a cutting from it near his garden, where it grew for several years on a small arbour in a neglected state, bearing a few grapes of a good quality. He then pruned the vine, enlarged the arbour, and spread the vine thin and regularly on it, and secured it by tacking and tying,

* It is the *Vitis Occidentalis* of Bartram, or Blue Bunch Grape.

to prevent its being displaced by wind, which is very injurious to vines. The growth of the vine and the quality of the grapes soon exceeded his expectation, and induced him to enlarge the arbour to the size of 60 by 40 feet, the whole of which the vine covered; he then extended his garden fence, so as to take it in, and manured under the vine by water from the barn-yard; and although the ground under the vine was covered with a strong sward of grass, which gave him three middling cuttings of grass, the vine produced the following crops of grapes.

In the year 1807, it yielded 36 1-2 bushels of grapes: 3 1-2 of the best were eaten and given away; the remainder were pressed, and yielded 91 gallons of juice: to the pumice, a small quantity of water was added, and on being pressed, 26 gallons more of juice was obtained. Both parcels were made into wine, three bottles of which were presented to the Agricultural Society of Philadelphia, and found excellent. Some of it had been made with sugar, and some without.

In 1808, the fruit was destroyed by rose bugs and drought.

In 1809, the vine yielded 26 1-2 bushels of grapes, and made 85 gallons of juice; water was added as before to the pumice, and the liquor which then flowed upon pressure, was mixed with the first running. The wine was tart at first, but grew sweeter as it advanced in age.

In 1810, it yielded 42 1-2 bushels of grapes, at one picking. Some had been previously taken off. A bushel of bunches weighed 34 lbs. Instead of water, Mr. Cooper added about 20 gallons of cider to the pumice, and mixed the produce of the first and second pressings: 150 gallons were thus obtained. Time only, can show the effect of this novel combination.

One year he omitted water, and fermented the pure juice; but the next year, owing probably to the quantity of tartar which it had deposited being re-dissolved, notwithstanding the cask had been well rinsed, and with gravel, after racking, it became tart, and he was induced to distil it for brandy, the quality of which was excellent. The addition of brandy to the wine when fermenting, increased the acidifying process. The wine was racked three times into a tub, but always returned to the same

cask. If a fresh cask had been used, probably the acid fermentation would not have come on. But the same cask is preferable. Mr. C. thinks that if water be added, there will be no danger of a second fermentation from the deposition of tartar.

A great advantage of the native species of grape in question over foreign grapes is, that the vine of the former is not injured by frost; whereas a slight frost destroys both the fruit and vine of the latter. Hence our native grape may be permitted to remain on the vines so late in the season, as that fermentation will not be affected by too great a heat. Mr. Cooper adds too, that they are not subject to blast or rot on the vines like foreign grapes.

The vine covers a surface of 60 feet by 40, making 2,400 square feet: there are 43,560 square feet in an acre, and consequently an acre would admit 18 arbours as large as Mr. Cooper's; but to allow free circulation of air, 15 would be sufficient, and on this calculation Mr. Cooper concludes, that this number of vines, "planted in a good soil and properly cultivated, would in five, or six years at farthest, cover an arbour as large as mine, and produce more and better fruit than mine does from one vine. And from the product of my single vine (which you have often seen) for several years past, I am confident that an acre of land, properly planted and cultivated with the best native grape-vines that can be found within a few miles of almost any farm-house in New-Jersey, or perhaps any state in the Union, would produce grapes sufficient to make fifteen hundred gallons of wine annually, in the way I have recommended. I need not mention its quality, as you have often tasted it."*

The following directions to make wine, by Mr. Cooper, contain his last improvements:

"I gather the grapes when fully ripe and dry, separate the rotten or unripe from the others, and press for distillation if the quantity is worth attending to; I then open the cider-mill so as not to mash the stems or seed of the grapes; then run them through, put the pomace or mashed grapes on some clean long straw previously made damp, and laid on the cider-press floor, lap it in

* Letter to the Editor, Dec. 8, 1810.

the straw, press it well, then take off the pumice and add some water, or I believe sweet unfermented cider would be better, and answer in lieu of sugar. After it has soaked awhile (but do not let it ferment in the pumice) press as before, put all together, and add sugar till it is an agreeable sweet. I have found a pound to a gallon sufficient for the sourest grapes, and white Havannah sugar the best; but sweet grapes make the best wine without any sugar.

“ I have heretofore recommended putting the sugar in after fermentation, but on experience find it not to keep as well, and am now convinced that all the saccharine matter for making wine should be incorporated before fermentation. Previously to fermentation, I place the casks three or four feet from the floor; as the filth works out, fill it up two or more times a day till it emits a clear froth, then check the fermentation gradually, by putting the bung on slack, and tighten it as the fermentation abates. When the fretting has nearly ceased, rack it off; for which purpose I have an instrument nearly in the shape of a wooden shovel, with a gutter in the upper side of the handle; place it so as to prevent waste, and let it dribble into a tub slowly, which gives the fretting quality an opportunity to evaporate, tranquillizes the liquor, and hastens its maturity. When the cask is empty, rinse it with fine gravel to scour off the yeast that adheres to it from fermentation, then for each gallon of wine put in one pint of good high proof French or apple brandy, fill the cask about one-third, then burn a sulphur match in it; when the match is burnt out stop the bung-hole, and shake it to incorporate the smoke and liquor; fill the cask, and place it as before, and in about a month rack it again as directed above; the gravel is unnecessary after the first racking. If the match should not burn well the first racking, repeat it; and if it don't taste strong enough to stand hot weather, add more brandy. I have racked my wine three or four times in a year, and find it to help its ripening; have frequently had casks on tap for years, and always found the liquor to improve to the last drawing.

“ Being fully of opinion that our common wine grapes are capable of producing wine as good and as palatable, (prejudice aside)

and far more wholesome, than the wine generally imported at so great an expense ; and a supply of that article being very uncertain, I am induced to urge the making wine of all the native grapes that can be procured ; and in collecting them, to notice the vines that produce grapes of the best quality, and which are the most productive, as this will enable persons to select the best vine to cultivate and to propagate from. This ought to be particularly attended to, as there are many vines which produce good grapes, but few in quantity, and others very productive but of bad quality : and I believe full half the number that come from the seed are males, and will never bear fruit. The sex is easily distinguished when in bloom, by the females showing the fruit in the heart of the blossom as soon as open, and the male presenting nothing of that kind.

“ As the native grape-vine will not grow well from cuttings, the best way I know of to propagate them is by removing the vines, or laying branches in the earth to take root for a year or more, and when rooted remove them, or plant the seeds from the best kinds ; and when in bloom dig up the males. If well cultivated, they will blow in three or four years, but will produce different kinds, the same as apples ; and I have had some from the seeds superior to the parent.”

Mr. Cooper observes in one of his publications :—

“ In February or March, previously to the sap's running, I examine and trim the vines, observing which branches will suit best for training to different parts of the arbour, or whatever the vines are to cover ; a sufficiency of the strongest shoots to extend, or fill vacancies if wanted ; then cut the other side shoots of the last year's growth that appear large enough for bearers, leaving not more than three or four buds or eyes and the diminutive ones ; cut the dead and unnecessary old vines, close to the leading branches ; then spread the vines regularly over what they are to run on, and secure them from being shifted, by tacking or tying.

“ From trials and observations I am convinced, that the greatest error in making wine in our country is, using too much sugar and water for the quantity of fruit. The nearer wine is made

from the juice of fruit, without water, the better, with no more sugar than will make it palatable by correcting the acid, and brandy or good cider spirit to give it strength sufficient to keep through our hot summers. The spirit will incorporate with the wine, so that when it arrives to proper age, it will not be known by its taste that any had been in it."

CATTLE SHOW.

THE fourth show held under the direction of the Pennsylvania Society for promoting the breed of Cattle, took place at Bush-hill, on Monday the 2d of October last. The following Cattle were shown :

I. By Aaron Palmer, near Darby.

1. Two large handsome red working oxen, five years old.
2. One brown steer, three years old—1-4 deer—3-4 steer.

This animal was bred in the back part of the state of New-York. His dam was produced from a deer and a cow, as appear from the certificate now in the possession of A. Palmer, who procured the above mongrel from Benjamin Norton, a drover.—Weight 5 1-2 cwt.

II. By Laurence Seckel.

3. Three brindle steers, three years old, each supposed to weigh 9 cwt. 3 qrs.
4. Two five year old steers, one red, supposed to weigh 13 cwt.—These are intended to be stall-fed, but were in high order when shown.

III. By Martin Dubbs.

5. Two red steers, four years old—estimated weight of beef 18 cwt.
6. One black pied steer—supposed weight 9 cwt.

V. By George Hopple.

7. One large brindle steer, five years old—weight of beef 950 lbs.

8. One light red do.—weight of beef 800 lbs.
9. Four small steers, five years old, off grass, and in high order.

VI. By Jonathan Clift, Philadelphia County.

10. A large red and white bull, of the Alderney breed, seven years old.

VII. By John Barney.

11. Two red oxen, ten years old, large and in high order, the 4 qrs. of each weighing 900 lbs. by general computation.
12. A light brindle cow, of imported stock, with a very fine calf, nine weeks old.
13. A dark brown cow, and twin calves, remarkably large and fine.
14. A very handsome red milch cow.

VIII. By William L. Fisher.

15. A black cow, about seven years old, an excellent milker; she will retain her milk until about to calve, and was with calf when exhibited.

Mr. Cushman, from Genesee, brought 22 head of stock cattle for sale, which were disposed of at a fair price on the ground.

Mr. Mudge, also from Genesee, brought 128 head of stock cattle for sale, of a superior kind—24 head of which were sold on the ground.

The following Merinos were disposed of by public auction: they were of the Infantado flock, and imported from Spain by Capt. Stewart.

Three rams, for \$ 400 }
Three ewes, — 375 } each.

Two 3-4 Merino rams, the property of Mr. Howell, were also sold by auction, viz :

One from Col. Humphreys's stock, for \$ 100.

One from Dr. Mease's flock, by a ram of Col. Humphreys's, for \$ 65.—Both were bought by Mr. C. W. Hare.

Unfortunately the day proved uncommonly warm, which prevented many fine cattle being exhibited, particularly by Mr. J. Hart, Mr. L. Seckel, and others: it was the intention of the for-

mer gentleman to bring forward again his noble steer, shown last April, an account of which was given in the first number of this work, p. 56. Mr. Seckel also intended to exhibit twenty very fine fat steers, an account of whose weights will probably be given in the next number of this work.

The show is to be regularly continued Spring and Autumn, of which due notice will be given in the newspapers.

Drovers, farmers, and others, are invited to encourage the Society in their plan of holding a fair for the sale of all kinds of lean and fat cattle, and for horses, cows and sheep, and of farm-stock in general, on the day of their shows for breeding cattle.

WORMS IN FRUIT TREES.

THE following paper appeared in New-York in the year 1808, and the directions given have been tried with various success. Injurious insects are multiplying so fast among us, owing to the negligence of the farmers in destroying them, that any remedy, likely to succeed only partially, is worthy of attention. The Editor will thankfully receive an account of the result of an attention to the plan here recommended.

THE re-appearance of those armies of Caterpillars which infested, and even destroyed, so many of our fruit trees last summer, has this year induced me to make the following experiments :

1. On a young apple tree, at the bifurcation of the first limb, I made a moulding of clay mortar, (about 14 days ago.) On the 3d day, I observed an unusual commotion of the worms ; and that they appeared weak, emaciated, and their bright colour much diminished, appearing of a foxy brown. Some of them attempting to descend, when they came to the projection of the clay, fell to the ground. Others, which I suppose had fallen, had re-ascended to the clay ; but could not, or would not, pass it, though they appeared perfectly restored to their colour and size.

On the 5th day, I observed that their excrements, which before had seemingly filled the nest, had disappeared. On the 7th

day, the nest also had disappeared, and the worms almost gone, except some dead ones, and a few small, emaciated ones, which were scarcely able to move. On the 9th, the clay being very dry, some fresh looking worms had made a lodgment on the clay, and formed a new web over it. These I displaced, and gave the moulding a coat of fresh mud. They are now entirely gone.

2. On a cherry tree in my meadow, where a vast number of those vermin had nested, and devoured all the leaves, I placed a sod, so as to encompass the trunk, and be supported by the first limb. On the 7th day, the nest remained entire, but filled with dead worms, and but two or three living ones on the tree.

3. On a tree, similar to the last, I placed a sod in the bifurcation of the first limb, without making it to encompass either limb or trunk : on the 7th day, the worms on this were dead likewise.

4. Not satisfied with the foregoing unexpected results, as in the last experiment, I placed a sod, with the earth downwards, (as was the case before) in the second bifurcation of another tree, where I observed a considerable collection of worms on the trunk ; but none that I could see had as yet ascended to the limbs : and this morning I observed that they had eaten many of the leaves on the first limb, below the sod, and were ascending in considerable numbers to it. None appeared on the rest of the limbs, though there is room enough for them to ascend without touching the sods.

I do not feel myself warranted in saying that such success will invariably follow this method of preserving our fruit trees ; but the experiment is so easily made, that I think it well worth public attention.

d.

N. C.

Whitehall, May 27, 1808.

COMPOSITION

FOR HEALING WOUNDS IN TREES.

From the London "*Repository of Arts, Literature, Commerce, Manufactures, Fashions and Politics*, for March 1809."

I HAVE great satisfaction in submitting to my readers the following communication from Earl *Stanhope*, a nobleman, whose studies have been invariably directed towards the advancement of those branches of useful science, which tend more particularly to promote the welfare of mankind in general.

To the Editor of the Repository, &c.

Berner's street, Feb. 13, 1809.

SIR,

THE subject mentioned in your letter to me of yesterday's date, relative to the *healing of wounded trees*, is certainly very interesting; I will therefore (agreeably to your wish) inform you of my success, and in what manner I have obtained it.

The injury which is done to timber trees, and other trees, from the loss of large branches, occasioned by wind, or otherwise, is much greater than people in general are aware of. Every attentive person may easily perceive the *local* injury which takes place at and near the wound, where the tree becomes evidently rotten; but there is, in addition thereto, a *general* injury to the tree, which is produced in the following manner. When wet gets in at the wounded part, it finds its way downwards, between the solid wood and the bark, through the capillary intervals where the sap rises. As the wet, so introduced, cannot get out, it frequently tends to cause the bark to decay at the bottom of the tree, just above, or at the top of the ground. The capillary attraction, which causes the sap to rise, grows gradually weaker; the tree gets sickly; the tips of its upper boughs become rotten; and that fresh injury lets in more wet, which hastens the *general* decay: so that timber trees of the first size sometimes become hollow, or otherwise unsound, though the whole injury originated, perhaps, from the loss of a single large branch.

'To remedy these evils, I have applied to the wounds a composition that I discovered many years ago, and which, when properly used, has succeeded even beyond my expectation; for not only the bark grows over the wounds, gradually pushing off the composition, but even the *white wood*, as it is commonly called, grows under the new bark, so as to produce a radical and a complete *local cure*. Whether the local cure thus accomplished, will, or will not, stop the *general decay*, which proceeds from the united causes I have alluded to, will depend upon the degree of general injury that the tree had received previously to the composition having been applied, and likewise on the number of small branches, or boughs, broken off; inasmuch as a tree can receive, in the manner I have described, the same degree of general injury from several broken boughs, as it may from the loss of one branch of the largest dimensions. Wounds of an uncommon size in the bark of the trunk of the tree itself, have been completely healed by the same means. I have tried this plan on a great number of different sorts of trees, and I have always succeeded, if the composition was properly applied, and in due time: one application of the composition will frequently be quite sufficient, but some trees require it to be applied more than once. The elm, when very vigorous, is, generally speaking, of the latter description, on account of the great quantity of sap which weeps from its wounds, especially when the wounds are of a considerable size.

Oak, beech, chesnut, walnut, ash, elm, cedar, fir, asp, lime, sycamore, and birch trees, are, by an act of parliament of the 6th year of his present majesty, deemed and taken to be timber trees; and by an act of the 13th of the king, poplar, alder, larch, maple, and horn-beam, are also deemed and taken to be timber trees. The trial has been made on the greater number of these seventeen sorts, as well as on yew, horse-chesnut, and apple-trees, on various fruit and other trees, laurels, and shrubs.

If it be wished to saw the limb off, either *close* to the body of the tree, or *near* to it, great care should be taken that the separated limb, in falling, does not tear off the *bark* from the tree itself. This may be accomplished by first separating from the tree

the greater part of the limb, and then taking off the remaining stump, and also by sawing the bark of the limb completely all around before the wood itself is divided. If the limb be a very large one, a rope properly tied to it may be advantageously used, to prevent its injuring the tree at the moment of its being separated from it.

After the broken limb has been sawed off, the whole of the *saw-cut* must be very carefully pared away, by means of a spoke-shaver, chisel, or other sharp tool; and the rough edges of the bark must, in particular, be made quite smooth: the doing of this properly is of great consequence.

When the *saw-cut* is completely pared off, the composition hereafter mentioned must be laid on, hot, about the thickness of half-a-crown, over the wounded place, and over the edges of the surrounding bark: it should be spread with a hot trowel. The most convenient tool for this purpose, is a trowel somewhat similar in form to those used by plasterers, but of a greater thickness (such as of a quarter of an inch) in order to retain the heat the longer.

The *healing composition* is to be made as follows: Take, of dry pounded chalk, *three* measures; and of common vegetable tar, *one* measure; mix them thoroughly, and boil them, with a low heat, till the composition becomes of the consistency of bees-wax: it may be preserved for use, in this state, for any length of time. If chalk cannot conveniently be got, dry brick-dust, which has passed through a fine sieve, may be substituted.

I am, Sir,

Your obedient servant,

STANHOPE.

REMARKS.

THE composition of Earl Stanhope, is certainly preferable to the celebrated one by Mr. Forsyth, of lime rubbish, cow manure, and bone dust, which is objectionable from the nature of one of the ingredients, from the difficulty and trouble in making enough of the last mentioned article, and from the frequent re-

newal which it requires, in rainy seasons. Many suppose that there is some particular healing or medicinal property in the composition; but that is not the case; its efficacy depends upon keeping out the air and wet, and any other preparation capable of doing that, will answer as well as that of Forsyth. Mr. Bucknal, a celebrated orchardist, who had the care of the king's garden at Hampton Court, recommended tar and corrosive sublimate: I cannot see the utility of the latter ingredient.

EDITOR.

ACCOUNT

Of the produce of Milk and Butter from a Cow, the property of William Cramp, of Lewes, county of Sussex, England, for one season.

(From Communications to Board of Agriculture, vol. 5.)

IN 48 weeks, viz. from the 1st of May to the 2d of April, the cow produced 540 lbs. of butter, which sold for 1s. 6d. per lb. except for three weeks, when it brought only 1s. 4d.: total amount £41 7. The quantity of milk given, during the same time, amounted to 4921 quarts; being measured, when milked from the cow, there must be deducted for cream 540 quarts, leaving 4381 quarts of skim milk as the result; which being sold at one penny per quart, produced £.18 5 1.

Four large waggon loads of dung were made, and valued at 15s. per load, thoroughly rotten.

Calf sold for	£. 1 10 0
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Total produce	62 12 1
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£.64 2 1

The following expenses were incurred:

Grain consumed in the summer, during 26 weeks, 3 1-2 bushels per week, at 4d. per bushel,	£.1 10 4
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Bran, 1 1-2 bushels per week, at 8d. per bushel,	1 6 0
--	-------

£.2 16 4

Amount of expenses brought over,	£.2	16	4
Winter, 26 weeks, grain consumed 8 bushels, at 6d. per bushel,	5	4	0
Bran, 4 bushels per week, at 8d. per bushel,	3	9	4
Half hundred weight of hay per week, at 5s. 6d. per cwt.	3	11	6
Rent of land, whereon were raised the lucern, clover, carrots, &c.	0	15	0
Wages of a man, at the rate of £.52 per annum, supposing him to attend ten cows, the tenth part of which is	5	4	0
To the farrier for three drinks at the time of calving,	0	6	0
	<hr/>		
	£.21	6	2
Produce,	£.64	12	1
Expenses,	21	6	2
	<hr/>		
Profit,	£.43	5	11

The cow was fed with artificial grasses, sown on the following measured plats of ground :

	Roods. Perches.	
No. 1. A plat sown with red clover and rye } grass, containing }	0	19
No. 2. Do. sown with lucern,	0	2
No. 3. Do. sown with cow grass and white clover,	0	17
No. 4. Do. sown with red and white clover,	0	18
No. 5. Do. sown with lucern,	0	10 1-2
No. 6. Do. sown with carrots,	0	2 1-2
	<hr/>	
	1	29

FOOD AND TREATMENT.

The grass was cut and given to the cow in a rack, in her hovel, where she had a plat of about 18 square perches to range in. During the summer, she was fed on the above, three or four times a day, and at noon about 4 gallons of grain and 2 of bran, mixed; always observing to give her no more food than she

eats clean. During the winter, she was fed on hay, bran and grain, mixed as before stated, and five or six times a day, giving her food while milking.—The manger kept clean, and food never permitted to sour: and particular care taken to milk regularly and clean. Her udder was washed at milking times, with cold water, winter and summer. She was dry only 17 days. The cow was bred in Sussex, from a cow of the same county.

The Agricultural Magazine of Dr. Dickson, No. 1, published July 1807, gives the following account of the second year's produce of milk and butter, of this extraordinary cow :

Butter sold, 450 lbs.	£.32	9	6
Skim milk, 3687 quarts, at 1d.	15	7	3
Sold the calf for	1	10	0
Value of Manure,	2	0	0
	<hr/>		
	52	6	9
Expense of keeping,	21	10	8
	<hr/>		
Profit,	£.30	16	1

EXPERIMENTS MADE AT THE EARL OF CHESTERFIELD'S DAIRY,

Bradby Hall Farm, in the months of May and June, 1807 and 1808.

TABLE 1st.

Showing the Produce of three Milkings of each of the stated Breeds and Crosses.

PRODUCE OF THREE MILKINGS.

BREEDS AND CROSSES.	Milk.		Cream.		Butter. ozs.	Milk.		Pressed. lbs.	Cheese Curd.	
	qts.	pts.	qts.	pts.		qts.	pts.		lbs.	ozs.
Holderness	29	0	2	0½	38½	29	0	8	5	
Long Horn	19	0½	2	0	26	19	0½	7	3½	
Devonshire	16	1	1	1	28	16	1	5	9½	
Alderney	19	0½	1	1	25	19	0½	8	8½	
Devon and Holderness Cross	25	0	2	0½	32	25	0	8	3½	
Devon and Long Horn Cross	28	0	1	2	29	28	0	9	0	
Devon and Alderney Cross	12	0	1	0½	21½	12	0	5	0	

REMARKS ON THE CROSS BREEDS.

THE Devon and Holderness crossed produce a valuable stock, (very much resembling the Hereford) of a large size, hardy, kind feeders, and the meat of an excellent quality.

The Devon and Long Horn Cross are not so large as the former, but very hardy, are kind feeders, and the meat of a good quality.

The Devon and Alderney crossed, produce a very valuable stock; they are of a moderate size, much improved in symmetry, hardy, have a great propensity to fatten at an early age, when upon indifferent food, and the meat very rich.

The land upon which the above experiments were made, is of a middling quality, a mixed soil, and well watered.

REMARKS.

THE Editor is indebted for the above paper to an attentive correspondent near London. The Earl of Chesterfield has not been prominent among the amateurs at the Smithfield or Woburn cattle shows, but the above statement evinces his attention to the important subject of the dairy, and displays the judicious principles upon which he conducted the experiments. The determination of the question of the comparative excellence of the various milk breeds in England, or in any country, is highly interesting, and the trouble requisite to insure accuracy in the result, amid the numerous avocations of a farm, can only be duly estimated by those, who have a practical knowledge of the difficulties attending such experiments. The ascertaining the quantity of food eaten by each cow, during the time the experiments were carried on, was essential to the object in view, and in all such experiments, or of fattening, ought never to be omitted. It is to be regretted, that the Sussex or Suffolk polled breed of cows, which stand high as milkers in England, had not been permitted to compete with the others on the occasion. The result of the experiments prove the propriety of the selection of the Devon and Alderney breed, by the Cattle Society, in the premiums offered by them for imported milk breeds of cattle.

ON ENGLISH CATTLE.

THE following letters from Mr. Nicholson and Mr. Chandler are important, as coming from men of well known respectability, and scientific breeders, who have repeatedly gained prizes at the Smithfield and other cattle shows, for the fine stock they have raised or exhibited. They are answers to letters, written for the purpose of bringing to the point the question of the vaunted superiority of English cattle, for which the extravagant prices that are given, justly astonish the American farmer.

The breed of Mr. Nicholson must certainly be a great acquisition in any country, on account of their quick maturity, and the disposition to throw flesh and fat on the most valuable parts; and that American would deserve richly of his country, who would introduce it into the United States: but the candid statement of Mr. Chandler, and that of Mr. Knight, satisfy me, that the Hereford cattle, so much boasted of, are not so profitable as the common stock of our northern states, which, when fattened in our state, daily grace our market, and excite merited applause from the stranger.

Upper Darby, Delaware County, October 25, 1807.

SIR,

IN the "Globe" of May 9, 1807, it is stated, that you have sold your fine bull, for which premiums had recently been obtained from the York and Otley Agricultural Societies, to Wm. Downing, Esq. for one hundred guineas.

To an American farmer, this sum appears highly extravagant, for although the grazier and dairy-man are as well paid for their beef and butter in this part of the United States, as in any country: yet I will venture to say, that your bull might have remained to the day of judgment, if here, without bringing one quarter of the above sum, unless his immense size and extraordinary fatness would be likely to have reimbursed the butcher.*

Presuming that the breed of the bull you sold possessed some particular good qualities, I shall deem myself much indebted for some information respecting him. I especially wish to know in what way the purchaser is to be reimbursed, or to obtain good

* This was strictly true at the time the above letter was written, and even now, the spirit for improving our breed of cattle is only commencing in Pennsylvania.—December, 1810.

interest for his money ; because I take it for granted, that farming in England is not pursued upon the principle of sport or fashion, by the majority, but that the object is to obtain as good a return as possible from the land. I am by no means ignorant of the high value set upon particular breeds in England, but I am well convinced that a false judgment, and an imaginary value placed upon them, occasion the high prices at which they sometimes sell. A wealthy man may indulge his whim in giving five hundred guineas for a ram, cow, or bull, because they may be of a certain shape, which this or that great breeder and improver has declared to be perfection ; but the honest, hard-working cultivator, will reflect before purchasing, and ask himself, will the ram give me finer wool, or better mutton, than one which I can buy for one or two guineas ? Will the cow give me more milk than my own ? or will the bull enable me to raise a stock of kindly-working, easily-kept, fast-walking oxen, which, after having done my ploughing for three or four years, will furnish tender, fine-grained beef, marbled with fat on the ribs, rumps and surloins, after one summer's grazing ? In forming an opinion of the *real value* of the above animals, these considerations force themselves upon us, and I wish you to attend to them, in the answer I hope to receive from you.

I do myself the pleasure to send you a copy of the premiums proposed by our Agricultural Society, and shall also, if our communication be not cut off shortly, forward the first part of our transactions.

Accept my respects.

JAMES MEASE.

Mr. John Nicholson, Gipton, Yorkshire.

ANSWER TO THE FOREGOING.

SIR,

I RECEIVED your letter dated 25th October, 1807, requesting me to give you particulars respecting the bull I sold, which I will endeavour to explain to the best of my abilities. The first question you ask is easily answered ; the purchaser will receive

above one hundred guineas for cows this year, at one guinea each ; and there is little doubt but he will do as much for another or two to come : therefore, he will be soon reimbursed, and receive good interest for his money.

You will think that valuable beasts in England are easily to be met with ; but it is astonishing the slow progress the breed of cattle makes. I perfectly agree with you, that it is not the high price that makes them better ; but their value is so well known amongst experienced farmers, that they will neither sell nor let either cow or bull without a good price. To the butcher in Leeds the difference is material ; there is not less than five pence per pound difference in the price of meat in the same beast, and it is very common to see two, of seventy stone each, one of which is worth more by six or seven pounds than the other, by having his chief weights in the carcase or middle, as we call it here, such as the crops,* ribs, surloins, rumps, flanks, &c. which are worth at this time nine pence per pound ; the coarse parts (which are light in this sort of animal) about four pence : the other sort of beast is very light in all these valuable parts, but heavy in his neck, shoulders, thighs, &c. with a large head, and great bones, and very little fat on any part : it is well known there is this difference in two steers or oxen. I hope it will be allowed, that a valuable bull must be a great acquisition in a neighbourhood. The bull you mentioned weighed one hundred and sixty stone, fourteen pounds to the stone, *alive*.† Supposed to weigh one hundred and ten stone his four quarters,‡ then three years two months old. He stood on very short, small legs ; his breast very great, looks fine ; horns the colour of cream ; crops, surloins and rumps very flat and quite level, so as that a line would touch them all ; his flanks very great, dropping down with the lowest part of his belly. I have a painting of him, which cost seven guineas, and am strongly solicited to have a print. If I can get as many subscribers as will pay for the plate, I will make you a present of one, if you will accept it.

* I will take the liberty to relate to you how I came by my breed of cattle. Six years ago I rented a farm, sixty miles north from

* Chines.

† 2240 lbs.

‡ 1540 lbs.

here, in the North Riding of Yorkshire, where, for a few miles round, including a part of the county of Durham, prevails, without any doubt, the best breed in England. One of the first improving breeders is Mr. James Brown, of Albrough, near Richmond, whom I had the good fortune to get very intimate with, so as not only to improve my breed, but convince me of its great superiority. As a proof of the perfection of his cattle, I give you the following instance to judge of. In November, 1803, I sold six beasts, all of his own breed, then three years and a half old, for two hundred and thirty pounds seven shillings : or thirty-eight pounds eight shillings each. They were slaughtered at Leeds, by Mr. William Arton, and his book will certify, they weighed ninety-four stone each, 14 lbs. to the stone, the four quarters.* Their hides were sold for three guineas each. Tallow from nine to ten stone each.† This price was rather better than eight shillings per stone, sinking the offal ; the general run of the market that day was from six to seven shillings per stone, notwithstanding, the butcher does to this day acknowledge them cheap. There is another great advantage attending the improved breed of cattle, which is, that of easy calving : the cows in general are formed wider in those bones, and the calves have small heads and bones. I have kept thirty cows the last six years, and can say with confidence, I never had any difficulty, and very seldom any assistance to afford them ; but where the old breed still prevails, half a village is called together at a cow's calving, and very probably either the one or the other is lost. There is a disorder prevails much here, which is commonly called the milk fever, and numbers of cows die of it. They generally are attacked with it at from four to ten days after calving : I believe it arises from want of proper treatment. The common farrier or cow doctor is sent for, and gives a hot, or what he calls a comfortable drink, which generally terminates with death. I have tried a very simple experiment, for these six years past, as a preventive of this disorder. A few days previously to calving, I give the cows linseed cake, and when calved, give them twice a day, for three weeks, or a month, or till there is no danger of

* 1316 lbs.

† 126 lbs.—140 lbs.

the disorder taking place. From its coolness and easy digestion, I firmly believe it prevents the disorder. In my number of cows, for the last six years, I have not lost one; and some of my acquaintance, who have taken the trouble to try that experiment, are of the same opinion. I shall find great pleasure if this, or any other remark I have made, be of the least service to you or your Society.

I have the honour to be, Sir,
Your obedient serv't,

JOHN NICHOLSON.

Gipton, April 12, 1808.

* *James Mease, Esq. Sec'y to
the Agricultural Society,
Philadelphia.*

The following is part of my reply:

From the account you give of your bull, he must certainly have been a noble animal, and his good qualities entitled him to the high price at which he was sold. His breed would be an acquisition in any country. But I still much question whether such a price would be warranted in the United States, except in the new settlements, where the raising of stock is a great object.* The truth is, that if we have not such superior animals, we happily have not that bad breed of which you speak, which are difficult to fatten, and that often suffer in calving. Our cattle at four years and upwards, weigh from 500 to 1200, with one wintering on hay, and a summer and autumn grass; and as to cows, it is a very rare circumstance that they require any assistance at calving. In four years, only one of my cows out of eight, experienced any difficulty, and in two calvings since has not had the

* This is a general remark, and true, when applied to the purchase of stock for breed, with an expectation of profit. Individuals in different states, however, have occasionally given higher prices, when anxious to improve. Thus the late Mr. John O'Donnel and Mr. Patterson, of Baltimore, imported a Bull and two Cows from the successor of Bakewell, which cost when landed in America, \$2000. Four Cows from Amsterdam cost \$602.89. Upon the death of Mr. O'Donnel, the stock were sold, and brought from \$150 to \$200 per head, at public auction, in Nov. 1805.

least trouble.* The fathers of my farmer and of his wife, who keep many cows, and several others whom I have consulted, agree that difficult births in cows rarely occur. No medicine is given before calving, nor afterwards, unless the cow does not cleanse speedily, in which case it is a general practice to give the same remedy you recommend, viz. flaxseed, but in infusion, with a mess of warm water and bran. How these act, I do not know, unless the genial warmth they excite, causes the separation of the membranes. But the success of them I can vouch for, and it is singular that the same remedy should be resorted to in both countries.

Our beef of the first quality, off grass, and highly marbled, sells readily for 10*d.* 11*d.* and 12*d.* per lb. and late in the winter, or in the spring, if stall fed with Indian corn meal, and potatoes (turnips are never used) 14*d.* 15*d.* and 22*d.* are obtained. The great object with the butchers is, to kill cattle which diffuse their fat through the muscles, and our graziers know well the forms that have that disposition, and that thrive quickly. They uniformly refuse to purchase of the drovers the long-legged, narrow rumped animals (which however are now seldom seen) altho' formerly common, and that still go by the name of the "English breed," probably owing to the importation many years since, of the old bad breed you notice, before the improvements had taken place in English stock. With the view of knowing what forms of cattle are in highest estimation in England, our Agricultural Society imported "Scott's prize cattle," and we were surprized to find none of them differ from what we every day see in this state, except in the article of South Down sheep, which we have not. I have myself a pair of working oxen quite as handsome as those represented in Scott's work. Hence we conclude, that the common breed in England must be bad indeed, when such oxen as are common here, carry prizes at Cattle Shows. The fact of the scarcity of good cattle is confirmed by yourself, and it is really singular, that they should not abound, considering the length of time that has elapsed since the spirit of

* Dec. 1810.—No difficulty has occurred since the above date.

improvement began. Bakewell was known for his attention to the subject, and for the superiority of his cattle full forty years ago, and he was preceded by Webster, and one or two others. Since then, numerous improvers have appeared in various parts of the kingdom, and yet it seems to be necessary to stimulate farmers by high premiums, to adopt breeds which their own interest ought to lead them to propagate. Prejudice must certainly operate with much greater force in England, than in the United States, otherwise fine cattle would be much more plentiful than it seems they are at present; and royalty and nobility would not be required to mix with the crowd at Smithfield to break the force of habit, and to show by a comparison of good and bad breeds, what the farmers themselves ought long ago to have found out. Without wishing to eulogize my countrymen undeservedly, I must say, that had they enjoyed the same advantages in respect to Fowler, Bakewell, Paget, and other scientific graziers, our cattle would long since have arrived at their acmè of perfection, and even under present circumstances, we are making rapid strides, for it is only necessary to show that it is our interest to change our breeds, and the change is made without delay. We have none of those strong prejudices, which cause men to shut their eyes to improvements, from a supposition that their own stock is superior to all others.* They are not kept back by the amount of first advances, provided they see a chance for return of good interest, a consideration which duty to themselves and families require an attention to. They do not deem it right to gratify whim, or pay highly for mere beauty of form. A few examples shall be given in point. An English merchant, residing in this city, some years since imported a cow from England of the Teeswater breed,† at a great price, and soon afterwards wished to dispose of her. He however could not ob-

* The British Agricultural writers generally allow that this prejudice is the great obstacle to improvement in England.—The writer of the report on the agriculture of Westmoreland, drawn up for the Board of Agriculture, states, that a farmer, when asked what breed of sheep they had, replied, "*They are sic as God put on the land: we never change any.*"

† She was from the stock of Colling, of Stockton.

tain the price he asked, (\$200) but a captain of a ship bound to England, agreed to take her back free of cost, as she was then fresh in milk, and she was afterwards sold in Yorkshire to good account. Her form was good, and she herself was an excellent milker, but at the price asked for her here, she would not yield an interest equal to what a farmer would derive from the same sum laid out in four or five common country cows, or in three or four grazing steers. The want of a bull, moreover, of the same breed, or of one equally good, by which her race might have been continued, was another reason for the indifference evinced towards her; for it was risking too much to wait a time to determine whether she bred after herself, or from the bull. On the other hand, the proprietor of several rams of the true Dishley, or new Leicester breed of sheep, at New Brunswick, New Jersey, finds no difficulty in letting them for \$150 and \$200 per year, to farmers within fifty miles, because they have found out that their descendants fatten with great ease and are finely formed, while the American breed of sheep are difficult to fatten, and are long-legged and narrow-rumped, and because the lambs of the former will bring from three to four dollars at three months old, while those of our own breed will only sell for half that sum. I have crossed the ewes of the Dishley breed with the Merino, for the purpose of improving the form of the latter. Col. Humphreys sells his full blood Merino rams readily for \$100, because the wool brings \$1,33 per lb. Thus when value is returned, capital is freely advanced.* * * *

P. S. Dec. 1810. During the present year, 500, 700, 1000, and even as high as 1500 dollars were repeatedly given in New-York for Merino rams, which shows that the American improver is not deficient in spirit, when objects present themselves, that are likely to remunerate the adventurer. At present the great influx of Merinos has diminished the price, but it is highly probable that they will continue at \$100, and at that price no farmer should hesitate a moment about purchasing.

Moreton, near Aylesbury, [Bucks] April 3, 1810.

SIR,

ABOUT a fortnight since I was favoured with a letter from you dated June 22d, 1809, requesting my opinion on the merits of some of the different breeds of neat cattle in this island, which I will now endeavour to give you impartially—But in the first place must beg you to accept my acknowledgment of the high compliment you were pleased to pay me. My profession is *principally* that of feeding oxen for the London markets, and for that purpose have made use of those from most of the distinguished breeding counties.

The Herefords are certainly a very fine breed of cattle; they are good feeders, and when fat, come to very great weights; frequently to upwards of 200 stone, of 8 lbs. They are in general well kept by the breeders, and in confirmation of the statement of Mr. Knight, which you allude to, they seldom plough with fewer than 6 or 8 oxen in a team, or more than a statute acre per day; but the land in Herefordshire is the greater part stiff, and very heavy working. They are in general sold by the farmer at 5 or 6 years old. I should imagine what Mr. Knight means by their being “never fed without much loss to the farmer,” to be, that they can always sell them to the grazier to greater advantage (in the state he mentions) to be fed on better land, and nearer the London market, than to feed them themselves, as that must be done chiefly by artificial food, and consequently attended with great expense. They are not noted for speed, and are seldom fed at an early age; the general practice being to sell them as before stated, and then being kept from 9 to 15 months by the grazier, they are considered fit for market, and carry their meat on the most valuable parts, and of a good quality. The Hereford cows are handsomely formed, and very quick feeders, but do not stand in high repute as milkers.

The breed you mention, belonging to Mr. Nicholson, are the Durham, or an improved kind of what we term the short horns. The short horns are principally bred in the north of England, and fed on the rich marshes of Lincoln and Cambridge. They arrive at great weights at an early age, and are mostly sold at

3 or 4 years old, for the use of the great manufacturing towns in the north, and in Smithfield, for the use of the navy, army, &c. as they are very much inclined to be fleshy, and sold at an inferior price per stone to many other breeds. I should suppose it a principal reason of the Durham breed never having been exhibited for a premium, has hitherto in a great measure been owing to the necessity of their having worked at least two years, to qualify them for it, which so very few of them do; and another, the great distance they are from London; but I have no doubt if some few of the best of the Durhams were kept to the same age, and had the same treatment, they would be equal in weight and quality to the *Herefords*. The short horn cows are of a large size, and give a greater quantity of milk than any other breed we have, although not of so rich a quality as some others; they are the kind in general use in the vicinity of London, and others of our large towns, where it is the practice to sell the milk. The long-horned, on which the celebrated Mr. Bakewell bestowed so much attention, produces nice cows, much inclined to feed, and good milkers; but the oxen are coarse, and do not rank high, either for labour or feeding. Here I must beg leave to mention his breed of sheep, which as a long-woolled breed, stand unrivalled. I am happy to hear they have found their way into America, and have not the least doubt of their succeeding well with you. Not being an advocate either for very large animals, or feeding to an excess, I have endeavoured from experience to make use of that description of animals, which pay best for the food they eat, and are the readiest sale when fit for market. I have in consequence of late years used the North Devons. They are the best breed that I am acquainted with for the united purposes of labour and feeding, being very active, fast walkers, quick feeders, of a very good quality when slaughtered, and of a size now very generally preferred in our markets to the very large beasts, being from 100 to 150 stone of 8 lbs. They are worked in yokes, from 4 to 6 to a plough, and plough upwards of an acre per day; indeed they work harder than any other oxen in this country, for Devonshire is a very hilly country. I should suppose when you mention

ploughing near an acre per day with a pair of American oxen, the land must be level, and the soil light. There are very few oxen fed in Devonshire, but are sold generally at 5 years old, into the several grazing counties to be fed. The Devonshire cows are not of a large size, but very handsome forms, quick feeders, and give milk of a very rich quality.* Our largest breeds of animals are not held in that general estimation now which they were a few years ago; as a proof of this, they do not now make so much per stone in the London markets as the smaller kinds of an equal degree of fatness, which has induced me of late years to graze as well as Devons, some few Scotch beasts, for the purpose of going to market in the hot months, being of a smaller size than the Devons; they are good feeders, but not so well adapted to labour. I should suppose a yearling bull would not be procured in either Devon or Hereford, from the first breeds, for less than 100 guineas. It is impossible to give an opinion by which of our breeds of cattle it would be advisable to attempt the improvement of the American breeds, without knowing their particular properties; but I should think, from your description, they are at present at least a very useful breed, and I congratulate you, Sir, on the prospect of their further improvement, by the establishment of the Cattle Society you mention, and the distribution of premiums, a copy of which you were pleased to say you had sent, but which I unfortunately never received. I do not know of any print being taken of any of our prize cattle, or I should have felt pleasure in sending you a copy.

Any further information in my power to give you, respecting either the breeds of cattle, or other branches of our rural economy, shall with pleasure be transmitted you, and with a particular regard to accuracy and impartiality. If an English farmer *credited* the statement of Mr. Parkinson, I should not think it pro-

* "One acre of very good pasture (says Mr. Conyers,) will suffice for a cow: of middling pasture, one acre and a half: one ton of hay, or rather less, will be consumed by each milking cow in the winter months. Upon an average ten cows give five dozen pounds of butter per week in summer, and two dozen in winter, and a profit of £.13 14s. per cow is sometimes made in a year."—See Communications to Board of Agriculture, London, vol. 4.—EDITOR.

bable he would venture on a farming speculation to America ; but I think, Sir, you acknowledge he took his example from the worst part of the United States, and I will therefore accept of your kind offer of information, and request you will, if you should again favour me with a letter, inform me of the price of land, both arable and grass, either to sell or let, in either of the preferable states, and conveniently situated for markets, also the average price of meat, corn, and labour. I am happy to learn that the differences betwixt our respective countries are likely to be amicably adjusted, and that they may be so, and that we may long continue on terms of reciprocal friendship with our brethren of the United States, is the wish of,

Sir,

Yours respectfully obliged,

SAM'L CHANDLER.

Mr. James Mease, Sec'ry to
the Agricultural Society,
Philadelphia. }

ON DEOXIDIZING INDIGO.

THE following paper on this important subject is taken from some communications in the "*Tradesman, or Commercial Magazine*" of London. Various erroneous statements, explanations and theories, have been omitted, or rectified.

ON DEOXIDIZING INDIGO.*

The London method of dying blue, and of forming the pencilling blue of the Calico Printers.

(Communicated by a London Dyer.)

THERE are various methods practised by the calico printers and dyers to take the oxygen from indigo ; the follow-

* To deoxidize indigo, is to bring it back to the same colour, and the same state, with regard to the minuteness of its particles, as it appeared in immediately after its being expressed from the leaves of the indigo plant : this is termed "*springing*" by the dyers. When deoxidized, it passes instantly from

ing is used by the dyers of cotton goods, whose pieces are generally from 24 to 28 yards long, and 6-4ths to 9-8ths wide. Having two vats, each 6 feet deep, 3 1-2 wide, and 6 long, with a light frame to go so easily out and in, and two slides on the two sides to move up and down with hooks on the slides, and on each side of the frame on which they can be fastened by the two salvages at the top and bottom of the piece, (the slides are for the purpose of stretching the pieces, and are moveable, that they may be placed according to the width of the goods); take eight pounds of good indigo well ground, boil each pound with two of potash in one gallon of water for two hours, and then put it in the vat, which you mean to work as your dying vat, having previously charged with water; add four pounds of stone lime* newly slacked, to each pound of indigo, stir it up well, and put two pounds of copperas to each pound of indigo; stir it well again, let it settle 24 hours, when it ought to be fit to work. According to the shade of blue required, add or diminish your indigo, keeping the same proportions of lime and copperas; and when you find it get weaker, add lime and copperas, with often stirring up, until you have exhausted your indigo. The other vat, which is filled with pure water, is to dip the piece with the frame in and out as soon as it is taken from the former one, by which means the colour is rendered regular and level, that is, even and free from stains: for the liquor of the dying vat, when it first receives the air, fixes on the piece, and in taking it out of the vat, runs from the top selvage to the bottom one, and acquires oxygen from the air: thus the bottom selvage would, without that caution, become darker than the top; but this irregularity of colour is prevented by the water vat, as the piece is plunged

the blue to the green state, and springs, as it were, from the bottom of the vat, and becomes equally dissipated throughout. Chevrault, a French chemist, however, has shown, that the indigo exists *in the plant*, chiefly in the state of a *white matter*, which becomes *blue* as it absorbs oxygen. What is termed *springing*, then, appears not to bring the indigo back to the state of a white matter, as it exists in the plant, but to deoxidize, or, in other words, to separate the oxygen, probably to such a degree only, as to produce the green colour.—See Thompson's Chemistry.—EDITOR.

* Chalk is sometimes used, but is not by any means so good.

into it immediately on its being taken out of the indigo vat ; it washes off the colouring matter that would lie in loose particles, while, at the same time, the water gives out as much oxygen, to the indigo, as to let what has entered into the interior of the cloth remain.* For dark blues, the water vat may be done without, as the marks caused by the running of the colour are not discovered ; but for the light blues, it is indispensable.

There is no doubt but the cloth has an affinity for the indigo in that state, or when it came into the water the dye would wash off ; but the cloth impregnated with the liquor equal to the strength of that in the vat, whenever it comes in contact with the atmosphere, these minute particles, by acquiring oxygen, become in an instant larger, and are thus detained in the thread of the cloth ; in addition to this, if the cloth should be dipped into the vat again, it keeps the indigo that is on the piece from deoxidizing, and thus retains what it has got.

Indigo is one of the best dying drugs we are acquainted with for the consumer, as when it is on the cloth it is neither affected by acids or alkalis in common use, whilst astringents and iron make no stains ; through time it gets lighter by washing and air. The only method to make it as durable as can be, is to have the indigo as much deoxidized as possible, and let the cloth remain in the liquor one hour at least, so that it may penetrate well, and have the liquor so strong that the colour may be obtained with only one or two dips, because the longer the pieces are in the liquor, it penetrates the better into the interior of the thread, whilst the oftener it is dipped and receives the air, and dipped again, it lies more on the surface of the cloth in small particles, and by friction, or washing, or wear, falls off. There have been some dark blues that would rub and beat off as much colouring matter as might dye a good light blue.

It is general after blues are taken out of the water vats to run them through a cold liquor, composed of water and sulphuric acid, so sour that it shall taste in the mouth like lemon juice ; this is to take off what iron or alkali the piece may have got in

* It is more probable that the water is not decomposed, but that the oxygen is obtained from another source, viz. from atmospheric air.—EDITOR.

the vat ; it also destroys the greenish tinge, and makes it appear of a brighter blue ; they are well rinsed out of this sour liquor and washed in a little hot water, which tastes slightly of alum ; this also helps the fixity of the colour.

I shall now, sir, give you the method of deoxidizing indigo, as practised by the calico printers, for their pencilling blue :— Take 1 oz. of good indigo, 1-2 oz. orpiment, 1-2 lb. pearl-ashes, 1-2 lb. lime. Mix the lime and ashes together, let them settle, take off the clear ley, boil it to the strength, and quantity of caustic ley you want, then put in the indigo, boil it one hour, take it off the fire, let it cool, and then stir in the orpiment ; lastly, thicken it with gum arabic, according to the purpose for which it is wanted.

“ Indigo thus treated, penetrates uncommonly well, and is the fastest of all blues ; it is even more deoxidized than in the blue vat of the dyer ; it ought to be a yellowish brown, and when exposed to the air it changes from a yellow to brown, from that to green, and then assumes a blue. This mode, however, cannot be practised but in pencilling, for were it put upon a block for printing, from the exposure of such a surface to the atmosphere as would be necessary, it would most rapidly acquire oxygen and become blue before being applied to the cloth, and then its particles being enlarged, would lay on the surface and be washed off ; likewise the strength of the caustic alkali would injure the printing blocks ; however that might be got over if the first could. When the printers use the block in printing blue, they print on the indigo, finely ground, mixed with gum to make it work freely, then dry it ; have ready two vats, similar to those first mentioned, each filled with water ; with as much copperas in the one, and in the other as much lime, as the water in each will take up ; a frame must also be in readiness, like that described above ; let the piece be hooked on it, put it in the lime vat, then the copperas vat alternately, till the copperas and lime have deoxidized the indigo on the cloth so as it shall become fixed : this is what the printers call their China blue ; it is rather inclined to pale blue, but very durable.

The calico printers sometimes pencil on the top of a yellow, in which case, if copperas be used instead of orpiment, it darkens the astringent.*

Indigo is distinguished into two kinds, the *true*, and the *bastard*. The first generally fetches the highest price from its superiority, but it is most advantageous to cultivate the latter, because it is much the heaviest; the first grows well in many different soils, but the latter requires much rain. Both are liable to many accidents; sometimes the plant becomes dry, and is destroyed by an insect, and at other times the leaves, which is the most valuable part of the plant, are entirely devoured by caterpillars in the course of a few hours. It ought to be gathered with great precaution, for fear of making the farina that lies on the leaves, and is very valuable, fall off; when gathered it is thrown into the steeping vat, a large tub filled with water, and in the course of twenty-four hours it is completely fermented; the water is then run off into a second tub, called the mortar or pounding tub, the steeping vat is then cleaned out, to be used again with a fresh supply of plants. At the bottom of the tub or vat, but mixed with the water, is found a sediment of a very subtile earth, or the dregs which constitute the blue substance, and this is requisite to be separated from the useless salt of the plant mixed therewith, because this causes the dregs to swim on the surface of the water; to effect this, the whole of the water is forcibly agitated with wooden buckets full of holes, and fixed to long handles. This part of the process requires the greatest precaution; if the agitation be discontinued too soon, the part that is used in dying, not being sufficiently separated from the

* The deoxidizement of indigo is an important operation in the processes of the blue dyer. How necessary, it may be asked, would it be to the dyer to become acquainted with the true principles of this art? These principles are not acquired by practice. It is only by a knowledge of chemistry, that the preparations can be completely understood. Certainly many valuable improvements, founded on true chemical principles, would present themselves to his view, were he in possession of those facts, as the learned Berthollet and Bancroft have so decidedly proved, which are so essential in the whole routine of dying operations.—EDITOR.

salt, would be lost; if on the other hand, it was agitated too long, the different parts would be again mixed and form a new combination, and the salt reacting on the dregs would excite a second fermentation, that would alter the dye, spoil its colour, and make what is called *burnt indigo*. The precaution consists in the attention of the manufacturers from time to time to drawing off a little to examine in a clean vessel; when they perceive that the coloured particles are separated from the rest of the liquor, they leave off shaking the buckets, to allow time to the blue dregs to precipitate to the bottom of the tub, where they are left to settle till the water is quite clear. After the superfluous liquor is run off, the dregs remaining at the bottom having acquired the consistence of a thick muddy liquid, it is then drawn off into a settler; after it is again cleared of its superfluous liquid, it is drained into sacks, from whence, when water no longer filters through the cloth, and it becomes of a thick consistence, it is put into chests, where it entirely loses its moisture, and at the end of three months is fit for sale.

That which is known by the name of *Guitamala* indigo, the name of the place whence it comes, is the most perfect of all. There are several sorts made in the East-Indies, but that from the Isle of Java is the best, but its price renders it little used by dyers. The best ought to float on the surface of the water, and its colour ought to be a very dark blue inclining to violet, bright and sparkling, especially when broken. It may be tried by dissolving a little in a glass of water; if pure, it will mix equally, but if not, it will separate and fall to the bottom; the pounded is much more subject to adulteration than that sold in cakes.

The following account of an essential improvement in the preparation of indigo, is a translation from the French of citizen Bailev. It will undoubtedly be heard with astonishment, that although indigo has been manufactured during the space of nearly a century, its preparation still consists in such imperfect approximations, that amongst the best manufacturers, even ten, fifteen, and twenty tubs fail out of a hundred. Sometimes, either owing to want of experience, or the contrarieties of temperature, even a much larger number of tubs fail, and ruin the proprietor;

but through the exertions of the colonial proprietor of St. Domingo, Nazon, a means of preventing this failure is laid down. After describing the first process of cutting and macerating plants, similar to the one before related, he thus proceeds: "To bring the maceration to its ultimate point requires from fifteen to thirty-six hours, according to the temperature of the atmosphere at the time of the operation. It is also necessary to take into the consideration, the quality of the indigo plant, the nature of the soil that has produced it, and that of the water in which it is immersed. The first indication from which it is judged, that the process of maceration approaches its ultimate point, is the sinking of the scum, which has elevated itself into the space of about half a foot, which was left unfilled in the vat. When this scum has become a kind of crust, of a copper blue colour, it is then thought to be sufficiently macerated. However this plan was often insufficient, and there was another method on which greater reliance could be placed; this consisted in drawing off a small quantity of the water, by means of a cock in the lower part of the vat; this being received in a silver cup, notice is taken whether the fecula tends to precipitate itself to the bottom of the cup, from whence the maceration is then supposed to be perfect. Such was the process most generally practised, but it often led into error. To avoid this, we have seen means, which consists in accurately observing the water contained in the cup; five or six minutes after it has been poured therein, it forms round the sides a ring or edge, which is at first of a green colour, but afterwards it becomes blue. So long as the maceration has not produced its proper effect, this ring detaches itself with difficulty from the sides of the cup, but at last it is seen to precipitate and concentrate itself at the bottom of the vessel, always toward the centre, under the water, which is become limpid, though with a yellowish tinge. When these appearances are observed, they infallibly indicate the success of this first operation. The water is then drawn off into a second bason or tub, placed beneath the first. This second tub is termed the *batterie*, as its use is for beating the water, still charged with the fecula. In order that it may separate quickly, it is agitated, either by hand labour or the pow-

er of a mill, taking care not to agitate it too long, in which case the fecula would be remixed with the water, and instead of indigo, nothing more than muddy water would be produced; but to avoid this, it only requires attention. It is afterwards drawn off from the *batterie*, to a third or smaller receiver, called the *diablotin*; we then find the *batterie* covered with a very liquid blue paste, which is put into bags of coarse linen cloth of the form of inverted cones, which suffer the watery parts to run off; these bags are afterwards emptied of their contents upon tables in the drying rooms, where this blue paste is kneaded, and after it has acquired a denser consistence, it is spread out and cut into small squares, in order that it may dry the sooner; after which it is ready for sale.*

A set of experiments on the solution of indigo, in different kinds of sulphuric acid [oil of vitriol] were made by Mr. Buchholz, in 1805, who found that the British sulphuric acid was a bad solvent, unless it had been previously boiled with sulphur; that the acid manufactured in the north of Europe dissolved it well in its natural state; but when deprived of the sulphurous acid gas, it became as inefficacious as the English. Hence it appears, that the presence of this gas promoted the solution; of course the common sulphuric acid, in the state in which it is usually employed by the dyers, namely, blackened with vegetable matter, answers their purpose better than the purest.

[For the following original account of indigo, as an article of trade, the Editor is indebted to a commercial friend in this city.]

THE commercial world is supplied with indigo from Manilla, Batavia, Bengal, and Isle of France; likewise from Lima, and Guatimala;—from most parts and ports in the province of Caraccas; from St. Domingo, from New-Orleans, and from South-Carolina. Of all these sources, Guatimala, Bengal, and Caraccas are the most abundant, and their quality vastly superior. Manilla formerly produced a considerable supply, and was once es-

* The above mode of preparing indigo is different from that given by Bryan Edwards in his account of the West-Indies, to which the cultivator ought to have recourse. EDITOR.

teemed on account of the richness of its dye; for some years past it has decreased in quantity and quality. Batavia does not afford a quantity worthy of mentioning, and its quality is various.

Bengal manufactures a very large quantity; when exported it is packed in chests, weighing from 100 to 250 pounds net; it is subject to sworn inspection, and differs more in price than any description of indigo. I have seen Bengal indigo not much inferior to the very best of Guatemala, but the general run of their first qualities is about equal to the *Sobriente* of Caraccas: their middling is equal to Isle of France; and their inferior ranks with that made at New-Orléans. Bengal indigo finds a ready sale at most of the European markets; it is put up in square pieces.

The Isle of France formerly produced a considerable supply, but the effects of the revolution have reduced the quantity so, that the Island is not any longer looked to for any supply of consequence.

The interruption of trade with Lima, occasioned as well by the present war as the revolutions in old and new Spain, has prevented any supply of indigo from that quarter.

Guatemala has long afforded to the commercial world, a very extensive and rich supply of indigo. Its quality, generally speaking, is superior to all others; and there appears to be more *dye* and *better colours* produced from this indigo: when prepared for use from the *vats*, its form is in small pieces of very singular size and shape, but remarkable for their firmness and consistency; its package is in *seroons*, a species of bale made from a hide, and originally shaped when the skin was in a humid state; their weights are various, from 100 to 240 pounds Spanish weight. Indigo at Guatemala is subject to inspection, and the *seroons* have marks, descriptive of their various qualities.

The qualities are *Flora*, *Sobriente*, and *Cortes*—the meaning of which as well describes their value as their colour. *Flora*, or *Fleur*, is that indigo which produces the most exquisite blue; and which, on being pressed between your fingers, instantly pulverizes into the finest particles. Of this quality, their inspectors make three grades.

The second quality, *Sobriente*, signifies *purple*; its dye is not either as rich or as deep in colour as the *Flores*; but as the quantity is much larger than the first sort, and as its application is more various, this description of indigo meets with a more ready sale. Inspectors make likewise three grades of this quality.

The third quality is called *Cortes*, which signifies *copper*. It is the lowest kind of indigo, and used for inferior purposes; it is liable to the same remarks on the subject of inspection, as the two preceding.

In times of peace, the indigo produced in this extensive part of the Spanish dominions, is all shipped to *Old Spain*: it is transported from Guatemala to *Bodigas Altas* in *Gulfo Dulce*; and from thence carried to the mouth of that wonderful lagoon which empties itself into the Bay of Honduras. Ships of 100 guns can lay with safety off the entrance, but none can enter that draw more than from 5 feet 6 inches to 6 feet water. When over the bar, there is 15 fathom water.

Caraccas indigo, as it is generally called, from being the produce of that extensive province, is shipped from La Guira and Porto Cavello, and generally from all the ports in the Spanish Main. The quality of this indigo is somewhat inferior to that of Guatemala; but this difference is not great, as the European prices current will prove. There is an inspector at Caraccas; but since the existence of the present war, I have seen large quantities without the inspector's mark. There are three qualities, and of these the inspectors make on the two first three grades, and on the last two, the following marks:

1st. Flores,	.	.	.	F
Flores,	.	.	.	F 1-2
Flores byo,	.	.	.	B
2d. Sobre or Sobriente,	.	.	.	Cor. 1-2
			"	S 1-2
Sobres d	.	.	.	S
3d. Cortes 1-2	.	.	.	C 1-2
Cortes	.	.	.	C

In purchasing the article, where an inspection has taken place, these marks may prove very serviceable. The seroon generally

weighs 112 lbs. to 113 lbs. and when it is heavier, it is a sign that the quality is inferior. The quantity produced is immense, and the sale is at all times brisk.

The indigo from St. Domingo has entirely disappeared, occasioned by the revolutionary struggles in that Island.

The quantity produced from New-Orleans is now insignificant, and its quality so far inferior when compared with Guatimala, Caraccas, and Bengal, that it ceases to be an object with the Louisiana planters.

Carolina still produces indigo, and in a manufacturing nation like Great-Britain, where there are so many inferior goods made, and in the working up of which economy is so needful, Carolina indigo still finds a ready sale, but at a very reduced price.

Taking ten as the scale of perfection, I suppose the different grades of indigo thus to rate :

Guatimala,	1st	quality,	9—	Isle of France,	6—
	2d	—	8—	Manilla,	7—
	3d	—	7—	New-Orleans,	5—
Caraccas,	1st	—	9—	Carolina,	4—
	2d	—	8—		
	3d	—	6—		
Bengal,	1st	—	9—		
	2d	—	7—		
	3d	—	6—		

R.

SUBSTITUTE FOR VERDIGRISE,

AND ON THE MAKING VERDIGRISE.

From the "Tradesman."

WHEN I was making acetate of alumine, or what dyers call red mordant, the high price of French verdigrise occurred to me. I made a small experiment, and I think an article might be made for dyers and hatters, who use a quantity of it, at little more expense than blue stone, (or sulphate of copper,) which is 10*d.* per lb. and verdigrise is at 6*s.* or 7*s.* The difference

between blue stone and verdigrise (I mean to use the names common among dyers) is not great; they are the same metal, only prepared with different acids; the blue stone is copper, dissolved in oil of vitriol, and verdigrise is copper, dissolved in vinegar; the one a mineral acid, and the other a vegetable one. The last does not injure the cloth so much as the vitriolic acid; the dyer always prefers verdigrease before blue stone. The method I would propose is, to have strong pyroligneous acid purified from the oil, as it is now done, saturated with chalk, till none of its acidity is discoverable; then add liquid blue stone,* [solution of blue vitriol] about new milk warm, stirred well, I think about 2 lbs. of blue stone to 1 lb. of chalk; however, I generally used to know by the taste, which requires time and practice; but what is wanted is to have as much chalk as to take up the acid of the blue stone, and no more blue stone than the pyroligneous acid can hold in solution; a little practice will soon discover the proportions, according to the strength of the acids. The principles on which it acts are these: the vitriolic acid attacks the chalk, unites with it, and precipitates; while the pyroligneous acid unites with the copper in the blue stone, and is suspended.† Thus the clear you have is the same as the liquid verdigrease; this, I am pretty confident, will answer every purpose for which the dyer uses it, and will cost less than one-fifth of the price; and if the clear was taken and evaporated by heat, it would be the same as the verdigrise; however, dyers generally add water to it, so that by making it themselves, they would save the expense of the evaporation."

Thus far the Tradesman, or Commercial Magazine of London.

* Blue stone, or blue vitriol, is known in chemistry by the name of sulphate of copper; verdigrise is the subacetite of copper.—EDITOR.

† The correct rationale is as follows; The pyroligneous acid (which is nearly the same as acetic acid) is saturated with subcarbonate of lime, (chalk;) the carbonic acid is destroyed, and a compound of lime and pyroligneous acid is formed. On adding the sulphate of copper, (blue vitriol,) a double decomposition ensues; the sulphuric acid unites with the lime, and sulphate of lime (selinite or gypsum) is precipitated, whilst the pyroligneous acid combines with the copper, which remains in solution.—EDITOR.

Since verdigrise has attained so high a price in this city, our hatters have employed blue vitriol as a substitute, in forming their black dye. The process was published in the newspapers, by Mr. James Cutbush, chemist, of Philadelphia, and has since been generally adopted. It is as follows;—Dissolve 2 lbs. of white vitriol (sulphate of copper) in a sufficient quantity of water; to this solution add 1 lb. of potash; collect the precipitate, (or powder that falls to the bottom,) which may be washed and dried for use. The liquor which remains is thrown away. In this process, the sulphuric acid quits the copper and unites with the alkali, whilst the copper, being oxidized, is thrown in union with carbonic acid, (fixed air,) which is contained in the potash of commerce, and forms a sub-carbonate of copper. By this means, the sulphuric acid is completely detached, and the new compound will be found to answer all the purposes of the most costly verdigrise in dying; or, if the carbonate be treated with vinegar, a real verdigrise will be found.

In addition to the processes already mentioned, several have been invented in this city. Dr. Jackson has discovered a mode by which the true sub-acetate of copper may be made very economically. It is a fact well known, that in the preparation of verdigrise, copper is corroded by means of the refuse matter of the grape. It is well known, that this process cannot be employed, at least with any advantage, in this country; we have, therefore, to resort to other methods, by which the constituent parts may be united, in one operation; the economy of which is, at the same time, to be considered.

Verdigrise may be made for about 75 cents a pound, by decomposing sulphate of copper with potash, collecting the powder that falls to the bottom, (which will be found to contain acid and water, forming a carbonate and hydrate of copper) and mixing it with vinegar. By exposing this mixture to heat, excellent verdigrise will be formed.

The following mode is also recommended by "one of the trade."*

* From the "Tradesman, or Commercial Magazine." April, 1809.

"The indigo is first well ground, and boiled up with 2 lbs. of potash to 1 lb. of indigo, then 4 lbs. of lime, and 2 lbs. of copperas are put in a vat to 1 lb. of the colour; the water may be either less or more, as the shade may be wanted. The vat is raked up once or twice and let stand 12 hours, and then it ought to be fit for work. The above proportions yield a fine solid blue.

"There are various other ways of springing it, and the methods of the wool dyers are in some degree distinct from that of the cotton dyers; instead of being cold, they use the liquor warm; and it is often 'sprung' or deoxidized without copperas."

OBSERVATIONS ON THE DISTEMPER IN DOGS.

By Edward Jenner, M. D. F. R. S.

(From the Medical and Chirurgical Transactions.)

THAT disease among dogs, which has familiarly been called "the distemper," has not hitherto, I believe, been much noticed by medical men. My situation in the country favouring my wishes to make some observations on this singular malady, I availed myself of it during several successive years, among a large number of fox hounds belonging to the earl of Berkeley; and from observing how frequently it has been confounded with hydrophobia, I am induced to lay the result of my inquiries before the Medical and Chirurgical Society. It may be difficult, perhaps, precisely to ascertain the period of its first appearance in Britain. In this and the neighbouring counties, I have not been able to trace it back much beyond the middle of the last century; but it has since spread universally. I knew a gentleman who, about forty-five years ago, destroyed the greater part of his hounds, from supposing them mad, when the distemper first broke out among them; so little was it then known by those most conversant with dogs. On the continent, I find it has been known for a much longer period. It is as contagious among dogs as the small-pox, measles, or scarlet fever among the human species; and the contagious miasmata, like those arising from the diseases just mentioned, retain their infectious properties a long

time after separation from the distempered animal. Young hounds, for example, brought in a state of health into a kennel where others have gone through the distemper, seldom escape it. I have endeavoured to destroy the contagion, by ordering every part of a kennel to be carefully washed with water, then white-washed, and finally to be repeatedly fumigated with the vapour of marine acid; but without any good result.

The dogs generally sicken early in the second week after exposure to the contagion. It is more commonly a violent disease than otherwise, and cuts off, at least, one in three that is attacked by it. It commences with inflammation of the substance of the lungs, and generally of the mucous membrane of the bronchiæ. The inflammation at the same time seizes on the membranes of the nostrils, and those lining the bones of the nose; particularly the nasal portion of the ethmoid bone. These membranes are often inflamed to such a degree, as to occasion extravasation of blood, which I have observed coagulated on their surface. The breathing is short and quick, and the breath is often fetid. The teeth are covered with dark looking mucus. There is frequently a vomiting of a glary fluid. The dog commonly refuses food, but his thirst seems insatiable, and nothing seems to cheer him like the sight of water. The bowels, though generally constipated as the disease advances, are frequently affected with the diarrhœa at its commencement. The eyes are inflamed; and the sight is often obscured by mucus secreted from the eye-lids, or by opacity of the cornea. The brain is often affected as early as the second day after the attack. The animal becomes stupid, and his general habits are changed. In this state, if not prevented by loss of strength, he sometimes wanders from his home. He is frequently endeavouring to expel, by forcible expirations, the mucus from the trachea and fauces, with a peculiar rattling noise. His jaws are generally smeared with it, and it sometimes flows out in a frothy state, from his frequent champing. During the progress of the disease, especially in its advanced stages, he is disposed to bite and gnaw any thing within his reach. He has sometimes epileptic fits, or quick successions of general, though slight convulsive spasms of the muscles. If the dog survives,

this affection of the muscles continues through life. He is often attacked with fits of a different description. He first staggers, then tumbles, rolls, cries as if whipped, and tears up the ground with his fore feet. He then lies down senseless and exhausted. On recovering he gets up, moves his tail, looks placid, comes to a whistle, and appears in every respect much better than before the attack. The eyes, during this paroxysm, look bright, and unless previously rendered dim by mucus, or opacity of the cornea, seem as if they were starting from the sockets. He becomes emaciated, and totters from feebleness in attempting to walk, or from a partial paralysis of the hind legs. In this state, he sometimes lingers on till the third or fourth week, and then either begins to show signs of returning health (which seldom happens when the symptoms have continued with this degree of violence) or expires. During convalescence, he has sometimes, though rarely, profuse hæmorrhage from the nose. When the inflammation of the lungs is very severe, he frequently dies on the third day. I knew one instance of a dog's dying within twenty-four hours after the seizure, and in that short space of time the greater portion of the lungs was, from exudation, converted into a substance nearly as solid as the liver of a sound animal. In this case, the liver itself was considerably inflamed, and the eyes and flesh universally were tinged with yellow, though I did not observe any thing obstructing the biliary ducts. In other instances, I have also observed the eyes looking yellow.

The above is a description of the disease in its severest form ; but in this, as in the diseases of the human body, there is every gradation in its violence. There is also another affinity to some human diseases, viz. that the animal which has once gone through it, very rarely meets with a second attack. Fortunately, this distemper is not communicable to man. Neither the effluvia from the diseased dog, nor the bite, have proved in any instance infectious ; but as it has often been confounded with canine madness, as I have before observed, it is to be wished that it were more generally understood ; for those who are bitten by a dog in this state, are sometimes thrown into such perturbation, that hydrophobic symptoms have actually arisen from the workings of the

imagination. Mr. John Hunter used to speak of a case somewhat of this description in his lectures.* Having never, to a certainty, seen a dog with hydrophobia, I am of course unable to lay down a positive criterion for distinguishing between that disease and the distemper, in the precise way I could wish; but if the facts have been correctly stated, that in hydrophobia the eye of the dog has more than ordinary vivacity in it, and as the term implies, he refuses to take water, and shudders even at the sight of it, while in the distemper he looks dull and stupid, is always seeking after water, and never satisfied with what he drinks, there can be no loss for a ready discriminating line between the two diseases.

March 21, 1809.

REMARKS.

EVERY man acquainted with general science, and especially every medical man, knows the high reputation which Dr. Jenner has deservedly obtained as an acute observer, an accurate reasoner, and especially for the introduction of the vaccine disease, which is fast dispelling the loathsome small-pox from the world. They will therefore set great value upon whatever comes from his pen: but it may not have happened to many of my readers who are interested in the subject he has last discussed, to know any thing of his character, and therefore this information respecting it is given to insure greater attention to his remarks.

As all are liable to be bitten by dogs, all are interested in knowing the distinguishing marks between the *distemper* and canine madness, which are so accurately pointed out by Dr.

* A gentleman who received a severe bite from a dog, soon after fancied the animal was mad. He felt a horror at the sight of liquids, and was actually convulsed on attempting to swallow them. So uncontrollable were his prepossessions, that Mr. Hunter conceived he would have died, had not the dog which inflicted the wound been fortunately found and brought into his room in perfect health. This soon restored his mind to a state of tranquillity. The sight of water no longer affected him, and he quickly recovered.

See also Percival's *Essays, medical, philosophical and experimental*, vol. 2d, page 368: and *Inaugural Dissertation on the disease produced by the bite of a mad dog*—1792; page 93—by the EDITOR.

Jenner. It is owing to the want of this knowledge, that much uneasiness has often been suffered by persons bitten by dogs ; but what is as bad, if not worse, this ignorance has contributed to the reputation of a variety of nostrums for the cure of the disease in mankind arising from the bite of a dog really mad, commonly but improperly called hydrophobia. Even to name those remedies would be tedious ; the fact applies to all nostrums, except to the miraculous Chinese snake stone, so celebrated in certain parts of Virginia, which on being applied to a wound given by a dog not mad will fall off, but if by a dog actually mad, will adhere until it extracts all the venom!!!* (*risum teneatis ?*)

The sportsman, and country gentleman, whose amusement so much depends upon his hounds, pointer or spaniel, will consider the value of Dr. Jenner's paper lessened in consequence of no cure being offered for either disease, especially the distemper, which is very fatal in the United States : and this defect I shall attempt to supply.

Taplin, whose writings on the horse are familiar to the lovers of that noble animal, gives a chapter on the disease in question, and after denying the truth of the old opinion, that its seat is in the head, and asserting the inefficacy of the common remedy, viz. a seton in the pole of the neck, says, that it is seated in the throat, stomach and intestines ; that obstructions exist in the two latter, and that the proper remedy is to give repeated glysters to relieve them. He tried purgatives by the mouth, but they were rejected : he used the following formula, " without a *single loss*."

Strong decoction of rue, half a pint ;

Lenitive electuary, and common salt, of each a quarter of an ounce ;

Olive oil, two table spoonsful—mix and inject warm.

This was repeated every two hours, until a quantity of hardened fæces was discharged ; after which the animal took nourishment and recovered. He says that he has " observed hounds, greyhounds, pointers, and the larger dogs, were usually attacked between eight months and twelve : while spaniels, terriers, and the smaller kinds, suffered between four months and nine." These

* Medical Repository, Hex. 2d, vol. 4, page 248.

dates should be attended to, as they will enable owners of dogs to form a probable opinion whether a complaint with which they may be attacked, is the "distemper" or some other disease.

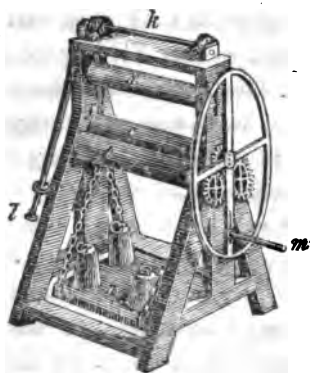
A sporting friend assures me, that he has constantly cured his dogs by freely giving them castor oil and calomel, so as to procure early and copious discharges, in the beginning of the disease, and by rubbing their noses with mercurial ointment. He is of opinion with Taplin, that obstructions in the bowels cause the disease, and adds, that numerous very small worms constantly abound in the fæces. Hence he supposes that they are partly concerned in causing the disorder. EDITOR.

ON MANGLING CLOTHES :

A NEW MANGLE DESCRIBED.

THE business of smoothing clothes, as usually practised in the United States, is a very serious one in a warm day, and many females have laid the foundation for an attack of acute disease, or of protracted ill health, by fatigue and imprudent exposure to a current of air after being much heated by a hard day's duty. To remedy these evils, mangles have been invented. These are long boxes filled with stones or iron, and made to pass over wooden rollers, placed on a frame below them, between which the article to be smoothed is placed. There are few families in Europe without one of these useful machines, by which the numerous articles having plain surfaces are smoothed with expedition, and acquire a gloss which cannot be given by flat-irons. They have been partially used in this country, and the great advantages derived from them, ought to cause their general adoption. Several forms have been in use ; the last but one is that of Mr. Jee of London, who in 1798, presented to the Society of Arts the model of an improved mangle, which was so constructed that the handle required to be turned one way only. But a friend in this city, who had one constructed precisely upon Jee's plan, found that it worked with difficulty, required great

power, and after many trials he was obliged to have it altered to the old plan, which he finds to answer well. Mr. J. Morris, of Snow-hill, London, has lately obtained a patent for one, of which the annexed figure will give an idea.



DESCRIPTION.

Two horizontal cylindrical rollers form a bed for the roller on which the linen to be mangled is rolled. One of them, *b*, is seen in the drawing. The axis of those rollers bear on brass, let into the wood frame, and have a wheel fixed to each, which works in a pinion on the axis of the fly wheel, as seen in the drawing: *c*; a moveable roller on which the linen to be mangled is rolled: *d*, a roller, the axis of which works in pieces of brass which slide between iron, let into the inner side of the wood frame, to the bottom of which, long pieces of iron, *f*, are fixed with hooks at their lower extremities, to which are attached the chains that support the scale or platform, *h*, where iron weights, or any other heavy substance, are placed; to the top of the brass in which the roller *d* works, the engine chains are fastened, which pass through apertures at each end of the top of the wood frame, and are there again fastened on the pulleys of the shaft *k* with a screw: *l* is a lever fixed to the end of the shaft *k*.

To use the machine, press the lever *l*, and fasten it with the hook, which raises the roller *d* with the platform and weights attached to it; then take out the roller *c*, and roll the linen and

mangling cloth round it, and replace it on the two bottom rollers, unhook the lever *l*, and the weights on the platform will press the roller *d* on the roller *c*; give motion to the fly wheel, and also to all the rollers, by turning the handle *m*, which in a short time will make the linen beautifully smooth; press down the lever, fasten it with the hook, and take the roller *c* out: a spare roller is supplied, so that if two people are employed, one may be filling it with linen, while the other is mangling.

None of the recent improvements in machinery have excited so much general attention as this machine; being constructed on true mechanical principles, and worked by one person with the greatest ease. From experiments which have been tried with it, it is found it will pass over all inequalities without the least difficulty or obstruction, the top cylinders and weights rising and falling as they approach; from the two bottom cylinders being put a little asunder, the one on which the linen is rolled acts as a wedge, greatly increasing the power of the weights, giving the linen three equal pressures. Upon the whole, this machine mangles with greater ease, performs its work better, and with more expedition, than any machine before invented, is very compact in its construction, and never subject to be out of repair.

ON CRIB-BITING.

THIS is one of the worst vices which a horse can contract. The following is the description given of it by Gibson:*

“**CRIB-BITING** is a vice to which many horses are addicted. It consists in a horse's catching hold of the edge of the manger, sucking in the air, and swallowing it down by gulps, till he is sometimes so full that he is ready to burst. The best way to discover this vice is, when one looks into a horse's mouth for his age, to take notice that his foreteeth are not worn; for when a horse has been long accustomed to this vice, the teeth will not

* Gibson's Diseases of Horses.

meet in some places by the breadth of a finger. A horse never loses this ill habit during his whole life, and indeed all the methods hitherto used to break it have proved ineffectual. Horses that crib are of but small value; they drop a great part of their food unchewed, which causes them almost always to look lean and jaded, with a staring look; and consequently few of them are able to endure much labour: besides, they are subject to gripes and other maladies, which are owing to their continually sucking and filling themselves with air."

It was my misfortune in May 1804, to buy a pair of well-looking horses, 6 and 7 years old, intended for a farm. They were in good order, they moved well, and I saw them repeatedly in the stable, without discovering either of them to be affected by the vice in question. They had not, however, been long at the farm, when one of them was found indulging himself in the habit. Every day it seemed to increase, and in the course of a few weeks, it became a confirmed habit. I then applied to some of the experienced horse masters in Philadelphia, who recommended with one voice, the application of a stout leather strap round the neck of the horse, and drawn so tight as to press upon the wind-pipe. This remedy however was found only a palliative; for as soon as the strap was taken off, he returned to his old practice, and seemed to take more pleasure in the indulgence of it than in eating; for often leaving his pasture, he would walk to the fence, and stand there biting the top rail, and gulping in wind for an hour at a time, until he had swelled his body to much beyond its natural size. In the stable, he would open his mouth when full of oats or short feed, and in like manner seize the edge of his manger, while the food would drop at his feet. Thus from the combined causes of gulping wind and deficient sustenance, he became so weak in the course of a few months, as to give out when drawing me in a chair, to my farm, distant about 6 miles from the city. I applied to the man from whom I purchased the horses, but not receiving satisfaction, I sold the horse at public auction, (declaring the trick he had,) for much less than first cost, and commenced an action against the cheat for the balance. After waiting three years for trial of the cause, the man died.

The horse must certainly have had the trick when I bought him, but by some means was prevented from indulging in it, and thus preserved his health; those means were unknown to me. When upon my determining to sell the horse, I inquired of the *knowing ones* their opinion whether he might not be considered as unsound, I found they were much divided. Some had never heard of the vice; others said it was not usual to include the trick in a general warrant of soundness, and that one of the finest turf stud horses of the time in Virginia, who swept the stakes at Washington City, could be heard all over the race-ground by the noise he made when biting the fence. I concluded therefore that a stud-horse might not be injured by what certainly proved hurtful to a gelding. Others again were of opinion, that any vice which would lead to debility and consequent diminution of strength, ought to be considered as an unsoundness, and might therefore justify the claim of damages. At all events, a deception was practised, and as it was clear that the horse had the trick at the time of the purchase, and soon became deficient in strength in consequence of it, I did not doubt of receiving a verdict in my favour, had the cause been tried. Since that period I have made the freedom from "crib-biting," an indispensable item in the general warranty, when purchasing a horse.

White* says, that the common remedy, a leather strap round the neck, is seldom effectual, and that a better method is to cover the edge of the manger, and every other part the horse can lay hold of, with sheep-skins, the wool side outwards, until the habit is destroyed.

* Compendious View of the Veterinary Art, London, 1802.

METHOD OF CLEANSING

Silk, Woollen, and Cotton Goods, without injury to the texture or colour.

TAKE raw potatoes in their natural state, as when dug out of the earth : let them be well washed, and rubbed on a grater over a vessel of clean water to a fine pulp. Pass the liquid matter through a coarse sieve into another tub of clear water : let the mixture stand till the fine white particles of the potatoes are precipitated ; then pour the mucilaginous liquor from the fecula, and preserve this liquor for use. The article to be cleansed should then be laid upon a linen cloth on a table, and being provided with a clean sponge, dip the sponge into the potato liquor, and apply it thus wet to the soiled article, which should in like manner be repeatedly rubbed with the potato liquor till the dirt is perfectly separated. The article should then be washed several times in clean water, to remove the loose dirt ; and may afterwards be smoothed or dried.

Two middle-sized potatoes will suffice for a pint of water ; and it has been stated, that the white fecula, separated in making the mucilaginous liquor, may be applied as a substitute for tapioca, and make a nutritious food with soup or milk, or may be employed in the manufacture of starch or hair-powder. The coarse pulp, that does not pass the sieve, is asserted to be of great use in cleansing worsted curtains, tapestry, carpeting, and other coarse goods. The mucilaginous liquor of the potatoe will clean silk, cotton, or woollen goods of any kind, without damaging the texture of the article, or spoiling the colour. It is further applicable to the removal of dirt from oil-paintings, or soiled furniture ; and dirty painted wainscots may be cleansed by wetting a sponge in the liquor, then dipping it in a little fine clean sand, and afterwards rubbing the wainscot therewith.

The above simple process was invented by Mrs. Morris, (Union-street, Middlesex Hospital, London,) on whom the Adelphi Society of Arts conferred a premium of fifteen guineas, after various satisfactory experiments had been made on fine and coarse goods of various fabrics.

MICHAUX'S HISTORY

OF THE FOREST TREES OF NORTH-AMERICA.

MR. F. ANDREW MICHAUX, son of the well-known botanist, who resided many years near Charleston, South-Carolina ; has published at Paris, during the present year, a few of the first numbers of his "**History of the Forest Trees in North-America**," in reference chiefly to their uses in the arts, and their introduction in commerce, and likewise to the advantages which they offer to the governments of Europe by cultivating them. The following is an extract from the prospectus of his work.

" WE know that North-America contains in its vast forests an immense variety of trees ; those in the United States alone amount to nearly 150, whilst in Europe, we can scarcely enumerate 40. During my residence in the United States, I sent to the administration [of France] numerous parcels of seeds ; and I spent the greatest part of my time in collecting all the opinions acquired by experience, on the qualities of woods, and their different degrees of utility in the arts. I have been obliged also to take many journeys, to acquire a greater number of facts, in order to procure all the desired information. Beginning with the District of Maine, where the winter is as inclement and as long as in Sweden ; I crossed first all the Atlantic states to Georgia, where, for half the year, the heat is as intense as in the West-Indies. I travelled also more than 1556 kilomètres, [400 leagues] from the north-east to the south-west. I performed, in different latitudes, five other journeys, in the interior of the country : the first, to the source of the river Kennebec ; the second, from Boston to Lake Champlain ; the third, from New-York to the Lakes Erie and Ontario ; the fourth, from New-York to the borders of the rivers Monongahela, Alleghany, and Ohio ; and the fifth and last, from Charleston in South-Carolina to the sources of the rivers Savannah and Oconee. In my first journey, along the coast, I stopped in the principal sea-ports, in order to visit the ship-yards, and in general all the shops of workers in wood. I made it a point to consult the most skilful native workmen, and more particularly those from Europe, whom I found capable of

judging of the respective qualities of the different woods found in the two continents. I shall make known those of America, which are the object of a considerable commerce between the central, southern, and northern states, and those which are exported to the West-Indies and to Europe, as well as the interior parts of the country, whence they are derived, and the sea-ports, from which the different exportations take place. I will also point out the best kinds of trees for fuel, and those the barks of which are used for tanning, and give their comparative prices.

“ In travelling from the north to the south, I carefully observed, the place of growth and disappearance, of different species of trees, in consequence of a milder temperature, or of a marked change of soil. I gathered, in the different states of the Union, all the common names, to annex them to the scientific appellations. I observed the forests, either as they presented a primitive appearance, or as changed by the vicinity of civilized or domestic animals, the influence of which diversifies so rapidly the face of nature. Such are the principal objects, which attracted my attention, and of which I intend to give an account. I will also faithfully point out the species of trees, which I think useful to propagate for the amelioration of the European forests ; and those that only deserve to be introduced into parks and gardens, on account of the beauty of their foliage.

“ Such is the outline of the researches to which I have devoted myself, and the result of which I have the honour to offer to the public. I thought that the manner in which I have viewed my subject, in directing my observations to a point of general utility, and which had not been done before, would secure my work in Europe and the United States a more favourable reception than if I had treated it in a scientific point of view.

“ The work will be composed of twenty-five numbers. But if, contrary to my expectations, it does not meet with that encouragement, which I hope the importance of the subject entitles it to, and if at any time I am obliged to suspend my publication, I announce to my subscribers, that I have adopted a plan of keeping the genera separate, so that one, two, or three numbers will contain a complete history of one genus of trees, as pines, nut-bearers, maples ; so that they will possess so many complete and

separate treatises, which will also give the facility of procuring the particular genera which they may desire. One number will be published every month, and be composed of six coloured plates, with descriptions to each. The plates are engraved from drawings by Messrs. Redouté and Bessa, eminent painters in natural history. The best will be in royal octavo, and printed on very fine paper. The price of each number will be 13 francs and 50 centimes, [\$ 2 50.] An edition in English will be published in Philadelphia, accompanied by plates, precisely similar to the French edition, with this difference only, that the common names of trees will be given in place of the botanical ones."

The Editor is well acquainted with Mr. Michaux; has witnessed his assiduity in collecting information from workmen in Philadelphia, and has no doubt of his work proving eminently useful. The execution of the plates will be in the highest style of elegance. Every college, and public school ought to possess a copy of this work, and also of the superb work by the father of Mr. Michaux, on the American oaks, which may be bought for the low price of \$10. But our seminaries of education unfortunately deem such knowledge degrading, and set a value only on those branches of learning, which are inapplicable to the common purposes of life, or to the business of the world, and which, to nine-tenths of those who get a smattering of it, is totally useless, and forgotten after they leave college or school.

TUBULAR IRON BRIDGES.

A PROJECT has been some time in circulation for the construction of iron bridges, upon a new plan, by J. Joshua Dyster, from England, who, we are informed, is now constructing a bridge of 150 feet span, which is intended to be put up in some convenient place, in or near the city of Philadelphia, in order to exhibit the principles of the tubular bridge, and as a specimen of its advantages over other bridges.

This construction of an iron bridge, is said to be upon an entire new principle, and to possess the following advantages over any yet erected:

That it may be made at less expense, and in half the time which a wooden bridge will require ; uniting great durability, with a superior elegance of appearance :

That it may be formed of one single arch, much wider than any present mode of constructing stone or wooden bridges will admit of, sufficient to stretch over most navigable streams, where bridges are required, without any intermediate piers, and will not need an inconvenient height corresponding to its length ; although its extension may be from six hundred to one thousand feet span : And

That it will stand for ages without repairs ; being of prodigious strength, the effect of its peculiar principle.

To lay a number of foundations in the beds of rivers, particularly where they are wide and deep, is attended with great expense and labour ; and to obtain firm bases for a stone bridge, the laying of the piers is frequently as expensive as all the rest of the superstructure ; and if composed of wooden piles, as they must be very numerous, the expense cannot be inconsiderable : therefore, any good and substantial mode which will either require few piers, or supersede them altogether, except the buttresses on each shore, must be extremely valuable and important : the proposer of this system ascribes these properties to his plan.

Piers obstruct the flowing of the tide, and are likewise subject to be affected by the strong and impetuous action of the stream, and by the floating down of timber ; and in the winter season, are liable to receive much injury by floating bodies of ice. They are exposed also to shocks from timber, rafts and craft. The truth of these observations is obvious to every one who duly considers the subject. Mr. Dyster says his system obviates these objections.

Public companies or private individuals, who may wish any bridge executed upon these patent tubular principles, are requested to send their letters, post paid, addressed to Joseph Joshua Dyster, *Philadelphia*. These iron tubular bridges may be made from 30 feet to 1000 feet span in one arch, and unite durability with economy.

ARCHIVES

OF

USEFUL KNOWLEDGE.

VOL. I.

APRIL, 1811.

No. 4.

ON THE DECAY OF WOOD.

Inquiry into the causes of the Decay of Wood, and the Means of preventing it, by DR. PARRY.

(From the Eleventh Volume of the "Letters and Papers," selected from the Correspondence of the Bath and West of England Society for the encouragement of Arts, Agriculture, Manufactures, and Commerce, p. 226.)

1. **THE** power of wood in different forms to supply luxury, to promote science, and to guard and prolong human life, has made the means of preserving it from decay highly interesting to mankind. With this view various premiums have been offered by this and other economical societies. The object of the following discussion is to suggest the best means of prevention, chiefly by inquiring into the nature and sources of the evil against which it is intended to guard.

Wood, when killed by being separated from its root, is subject to gradual destruction from two causes---rotting, and the depredations of insects.

Of the rot there are two supposed kinds, as they affect wood, first, in the open air, or secondly, under cover.

The first is, that which in the terms of our premium, **Class VII. No. 3**, is said to occur to "barn and other outside-doors, weather-boardings, gates, stiles, and implements of husbandry." To

which, if there were any need of this minute specification, might have been added, posts, rails, paling, water-shoots, and various other objects.

The second is well known under the name of the dry-rot, the cause and prevention of which are the subjects of a premium by the Society of Arts in London.

Animal and vegetable substances possess certain common properties and movements, which constitute what is called life. When that state ceases, and these properties and motions no longer exist, the bodies become subject to the chemical and mechanical laws of all other matter.

When perfectly dry, and in certain degrees of temperature, both seem to be scarcely capable of spontaneous decay. On this principle vast quantities of salmon are annually conveyed in a frozen state to London from the north of England and Scotland; and the inhabitants of the still more northern regions constantly preserve their food by freezing, unchanged through the longest winters. The gelatinous and other soluble parts of animal substances, when extracted by boiling and kept in a soft moist state, very readily putrefy. But if the same matter be dried by a gentle heat, and secluded from moisture and air by being kept in bottles or metallic cases, it will remain very long without decay. This is the theory of that well-known and useful substance, portable soup. In the burning climate of Africa, when it is intended to preserve a dead animal for food, all that is necessary is to cut the muscular parts into thin strips, from which, in a few hours, the heat of the sun exhales all moisture, reducing them to a substance like leather or horn, which proves to be unsusceptible of future decay from putrefaction. So also entire human bodies, buried in the arid sands of those countries, have often been found converted by exhalation and absorption of their natural moisture into a dry, hard sort of mummy, incapable of any further change from the agency of those causes, to which, in such situations, they are exposed.

Similar causes produce the same effects on wood. Even under less rigid circumstances of this kind, as in the roofs and other timber of large buildings, it continues for an astonishing length of

time unchanged ; witness the timber of that noble edifice Westminster-hall, built by Richard II. in 1397 ; and the more extraordinary instance quoted by Dr. Darwin, in his ingenious work the *Phytologia*, of the gates of the old St. Peter's church in Rome, which were said to have continued without rotting from the time of the emperor Constantine to that of Pope Eugene IV. a period of eleven hundred years. On the other hand, wood will remain for ages with little change, when continually immersed in water, or even when deeply buried in the earth ; as in the piles and buttresses of bridges, and in various morasses. These latter facts seem to show, that if the access of atmospherical air is not necessary to the decay of wood, it is, at least, highly conducive to it.

In posts fixed in the ground and exposed to the weather, we constantly find that part soonest decay, which is just above or within the ground. So also where there is an accidental hole in an exposed surface, or any artificial cavity, as in a mortise and tenon, or the part where pales nearly touch the rails on which they are nailed, there the wood universally begins first to moulder away. The same thing happens with regard to horizontal rails themselves, which, when made of the same materials, rot much sooner than the pales which they support. These facts are very easily explained. They clearly show, that the great cause of decay is the constant action of water aided by air, which most affects those points where it is most retained, but has less operation, where, as in the perpendicular pales, it chiefly runs off by its own gravity, so that the little which remains is easily and quickly abstracted by the co-operating power of the sun and wind.

The change which I am describing is the consequence of putrefactive fermentation ; a chemical operation, in which the component parts of the wood form new combinations among themselves, and with the water which is essential to the process. The precise nature of those new compounds has not been ascertained ; but, so far as they are known, consist of certain gases, or species of air, which fly off, and leave behind a powder, consisting chiefly

of carbon or charcoal, and the earth which entered into the original composition of the wood.

Besides this chemical change depending on water, that substance tends to destroy wood exposed to the open air by a mechanical operation. Every farmer is acquainted with the power of winter in mouldering down the earth of his fallows. It is equally well known that porous freestone splits and shivers during severe winters. These effects are produced by frost, which, acting on the water in the pores or interstices of these substances, expands it by conversion into ice, and thus bursts the minute cells in which it was contained. There can be no doubt that a similar operation takes place to a certain extent in exposed wood, and thus in some degree promotes its destruction.

It appears, then, that the contact of water and air are the chief causes of the decay of wood. If, therefore, any means can be devised, by which the access of moisture and air can be prevented, the wood is so far secure against decay. This principle may be illustrated, by supposing a cylinder of dry wood to be placed in a glass tube or case, which it exactly fills, and the two ends of which are, as it is called, hermetically sealed, that is, entirely closed, by uniting the melted sides of each end of the tube. Who will doubt that such a piece of wood might remain in the open air a thousand years unchanged? Or let us take a still more opposite illustration of this fact; that of amber, a native bitumen, or resin, in which a variety of small flies, filaments of vegetables, and others of the most fragile substances, are seen imbedded, having been preserved from decay much longer probably than a thousand years, and with no apparent tendency to change for ten times that period. Let us see then if we cannot, by the exclusion of moisture and air, find means of virtually placing our timber in a case of glass or amber.

With this view, various expedients have been employed, of which the most common is covering the surface with paint; which is oil mixed with some substance capable of giving it the colour which we desire. It is well known that several of the oils, as those of linseed, hempseed, &c. become dry when thinly spread

on any hard substance. The drying quality is much assisted by their being previously boiled with certain metallic oxyds, more especially that of lead litharge. The crust so formed is with difficulty penetrated by moisture or air. For this purpose drying oil is spread on silk or linen, in the manufacture of umbrellas; and will tolerably well succeed in confining hydrogen gas, or inflammable air, in the construction of air-balloons. Hence we see the mode in which the application of paint on wood serves to defend it against the causes of destruction.

When paint is employed within doors, it is customary to add to the oil, besides the colouring matter, some essential oil of turpentine, which not only makes it dry more readily, but, by giving it greater tenuity causes it to flow more freely from the brush, and therefore to go farther in the work. For the same purposes I observe it forms a part of the paint used on wood and iron work in the open air, but, as it appears to me, most improperly; for I have remarked, that on rubbing wood painted white, and long exposed to the weather, the white-lead has come off in a dry powder like whiting; as if the vehicle which glued it to the wood had been decomposed and lost, leaving only the pigment behind: and I have been much inclined to suspect that this has arisen from the oil having been too much *pened*, as the workmen call it, or having its thickness and tenacity too much diminished by a superabundance of the oil of turpentine. In this state it may, in various ways, be more readily acted on by water and air. We know that the properties of what are called unctuous or fat oils are much changed by the admixture of the volatile or essential oils. On this principle we succeed in getting grease out of woollen cloths by oil of turpentine; but whether the same change is produced on the drying oils, I have not learned.

It appears then, that these drying oils, either by themselves, or boiled with metallic oxyds, will form a varnish on wood; but it may be questioned how far the colouring matters, with which they are usually mixed, contribute to increase there preservative power. I do not, however, deny that they may be serviceable in this and other views. They might be supposed to enable the

oil to lay firmer hold, as it were, on the wood ; and they may serve to increase the thickness of the defensive covering. The first of these points is of some importance ; for we observe that the paint on street-doors, which is become thick by frequent incrustation, is apt, from the strong influence of the summer's sun, to separate from the polished wood beneath, and rise in large blisters ; probably in consequence of a greater expansion in the crust itself than in the subjacent wood. Here, therefore, the colouring matter of the paint fails to produce the desired effect ; and as to the second end, or that of increasing thickness of the covering, that may, probably, be much more effectually accomplished than by the mere addition of pigments, some of which are capable of chemical decomposition, and all are costly. This purpose an ingenious artist has of late attempted to answer, by recommending an admixture of road-dust : and for that and other means of reducing the price of paints, has obtained a premium from the London Society of Arts. However just the general principle in this case may be, the application is somewhat unphilosophical ; unless it shall be found, which will scarcely be admitted, that dust of every chemical and mechanical quality will equally or sufficiently answer the intended purpose.

Some material of this kind, selected with greater precision, may however undoubtedly be useful ; and none I think promises more fairly than siliceous or flinty sand, which, so far as we know, is absolutely indestructible, and which may be easily procured from the sea-shore, and from the currents of the clear rivers and roads in Berkshire and other counties abounding with siliceous stones. Sand from the sea must first be cleared from all saline impregnations by washing in several waters, and any sand may be obtained of the fineness desired, by mixing it with water in a tub, and after having stirred the whole well together, pouring out, in a longer or shorter time, the muddy water, from which the sand will settle by its own gravity, in a state fit for use when dried."

More than 30 years ago this subject presented itself to my mind, on seeing some water-shoots which had been pitched and

painted in the common way, taken down in a state of complete rottenness. I had read that charcoal buried in the moist earth, had come down to us perfectly sound from the times of the Romans; and that posts long withstood the same moisture, if the part intended to be put into the ground was charred all round to a certain depth. Impressed with these facts, I determined to try an artificial coat of charcoal; and when new water-shoots were constructed, I strongly and carefully rubbed them with a coat of drying oil, which I immediately dregged all over with a thick layer of a charcoal finely powdered, and contained in a muslin bag. After two or three days, when the oil was thoroughly dried, and firmly retained the greatest part of the charcoal, I brushed off what was loose, and over that which adhered, I applied a coat of common lead-coloured paint, and a few days after, a second. The whole became a firm and solid crust; after which the shoots were put in their places, and being examined many years afterwards, appeared perfectly sound. Any other colour would probably have succeeded equally well with that which I employed. I do not think that lampblack, which is a pure species of charcoal, would have answered the purpose of forming a thick defensive covering so well as the grosser charcoal which I used. But whatever sort of charcoal is employed, it ought either to be fresh made, or heated again in close vessels, so as to expel the water which it greedily attracts from the air.

To all compositions formed from drying vegetable oils there is this objection: that however well they may answer the end proposed, they are too dear, for that great consumption which is usually required for outside work. For this and other reasons, various other substances have been employed for the same purpose.

Of these the most common is pitch, which is well known to be resinous matter melted by heat out of the pine tribe of trees in form of tar, and afterwards hardened by evaporation. It is applied hot, and when cold, makes a moderately hard varnish. It does not however appear, in fact, to answer the purpose so well as might have been expected. The sun at first melts it, so

that it runs off in drops, or adheres to every thing which touches it; and the united influence of air and water seems to make it brittle and powdery like rosin. Experience therefore shows it to be of little value. Neither is it probable that its powers would be much improved by admixture with charcoal, sand, or other similar substances. Many members of this Society may recollect its application twenty years ago on the red deal-shingled roofs of part of Bath Market. In this case it was used hot, mixed with Spanish brown, and hardened by sand sifted over it with a sieve; notwithstanding which it seems to have left the wood like the unmixed pitch, and, though frequently renewed, has not prevented the necessity of various repairs within these last five years. The original boards are now every where more or less in a state of decay.

The bituminous substance melted by heat out of coal, and commonly called Coal Tar, has been strongly recommended for this purpose by that ingenious philosopher Lord Dundonald. I have tried it largely and successfully, though perhaps not fairly; for the workman whom I employed, in order to make it work more easily, added to it oil of turpentine, which certainly diminished its durability by rendering it more miscible with water. I am however inclined to believe that no substance of this kind, used by itself, will become sufficiently dry and hard to resist the influence of the weather.

As animal oils are considerably cheaper than those expressed from vegetables, attempts have been made to communicate to them a drying quality. This has been effected by dissolving in them while hot various substances capable of being melted, in such a portion that the whole mass would become dry and hard when cold. Bees' wax, rosin and brimstone, are found to have this property. Some of them, when united with drying oil, have long been employed for making boots and shoes water-proof, or impervious to moisture.* But they will also succeed when mixed

* For this purpose there is the following receipt by Mr. Barker, in Sir John Hawkins's edition of that entertaining work, Isaac Walton's Complete Angler; 4th edition, page 223. "Take a point of linseed oil, with half a pound

with train oil, which is obtained from the blubber of the whale. In the second volume of the Memoirs of this Society, printed in the year 1783, there is the following receipt: "Melt twelve ounces of rosin in an iron pot or kettle; add three gallons of train oil and three or four rolls of brimstone; and when the rosin and brimstone are melted and become thin, add as much Spanish brown, or red or yellow ochre, or any colour you want, first ground fine with some of the oil, as will give the whole as deep a shade as you like. Then lay it on with a brush as hot and thin as you can. Some days after the first coat is dried, give it a second. It will preserve plank for ages, and keep the weather from driving through brick-work." Page 114.

This composition I tried about eighteen years ago on some elm paling, substituting for the colouring matter one or two coats of common white paint, for the sake of the appearance. This paling appears to me to be in every part of it which was so covered, as sound as when it was first put up.

As compositions of the resinous kind are apt to crack and become powdery, like the varnish of carriages, by exposure to weather, it is not improbable that this effect may be in some measure counteracted by the mixture of a small portion of bees' wax. Such a compound I have used, but in the quantity of 8 ounces to the gallon, found it too slow in drying, and capable of being easily scraped off with the nail. Wax is also at this time very scarce and dear.*

of mutton suet, six or eight ounces of bees' wax, and half a pennyworth of rosin. Boil all these in a pipkin together; so let it cool till it be milk-warm. Then take a little hair-brush, and lay it on your new boots; but it is best that this stuff be laid on before the boot-maker makes the boots; then brush them once over (with it) after they come from him. As for old boots, you must lay it on when your boots be dry."

* For the information of those who may be inclined to make a trial of these compositions, I have inquired the wholesale prices of the different ingredients of Messrs. Cave and Co. Bristol, from whom I learn that they are very fluctuating, train oil being from 2s. 3d. to 3s. 2d. per gallon; rosin from 12 to 21 shillings per cwt.; roll brimstone from 34 to 38 shillings per cwt.; and bees' wax from 3s. 3d. to 3s. 6d. per lb.; the lowest of these prices being about what these articles at present bear.

All the substances contained in these mixtures are capable of perfect incorporation with each other by heat, and when separately exposed, are with great difficulty acted on by water or air in any heat which occurs in our climate. They should be applied hot with a common painter's brush on the wood which is previously very dry, so as to sink deeply into its pores; and though at first they are apparently somewhat greasy when cold, yet after some days they make a firm varnish, which does not come off on rubbing. When it is required to give beauty to the work, colouring matters may either be added to the mixture, or afterwards applied over it in form of common paint. Two coats of the composition should always be given; and in all compound machinery, the separate parts should be so varnished before they are put together; after which it will be prudent to give a third coating to the joints, or to any other part which is peculiarly exposed to the action of moisture, such as water-shoots, flood-gates, the beds of carts, the tops of posts and rails, and all timber which is near or within the ground. Each coat should be dry before the parts are joined, or the last coat applied.

These compositions are equally efficacious in keeping iron from decay by rusting. They might also be very advantageously employed in rendering water-tight the plaster which is used to case the outside of the arches of vaults unsheltered by roofs, provided the mortar were made perfectly dry, and the covering of the arch brought up to an angle, instead of making it follow the form of the arch in an ellipse or the segment of a circle.

It is necessary to mention that compositions made of hot oil should, for the sake of security, be heated in metallic or glazed earthen vessels in the open air. For whenever oil is brought to the boiling point, or 600° of Fahrenheit's thermometer, the vapour immediately catches fire, although not in contact with any flame; and though a lower degree of temperature than that of boiling should be used in this process, it is not always practicable either exactly to regulate the heat, or to prevent the overflowing of the materials, in either of which cases, were the melting performed in a house, the most fatal accidents might follow.

The following is the proportion of the above ingredients, and the mode of mixing them, which I should recommend.

Take 12 ounces of rosin, and 8 ounces of roll brimstone, each coarsely powdered, and 3 gallons of train-oil. Heat them slowly, gradually adding 4 ounces of bees' wax, cut in small bits. Frequently stir the liquor, which, as soon as the solid ingredients are dissolved, will be fit for use. What remains unused will become solid on cooling, and may be re-melted on subsequent occasions.

If the addition of charcoal powder or siliceous sand contributes to the durability of drying oil, it may probably have a similar effect on this composition ; but whether it may be best to mix them with the ingredients, or apply them afterwards, I cannot from experience tell. In the latter case, the powder should be sifted on, while the first coat of the composition is still hot ; and after some days, when that is dry, should have a brush gently passed over it, in order to remove all the particles which do not adhere ; after which other coats of the composition may be applied, as before directed.

This is all which occurs to me as to the mode of preserving wood when exposed to the weather.

When wood decays under cover, that condition is usually called the dry-rot. Let us examine the circumstances in which this change takes place.

It affects the interior doors, shelves, laths which subdivide the layers of wine, and all other wood work in certain cellars ; beams and rafters which support the roofs of close passages ; joists lying on or near the earth ; the wainscoting of large rooms little inhabited, in old and especially single houses ; and wood in various other situations of a similar kind, which need not be particularized. In some of these cases, while one sample or portion of wood shall suffer the dry-rot, another specimen or portion shall remain unchanged. In other instances, wood of various kinds and qualities has been successively employed, and all has alike suffered. During the stages of change, a crop of mucor or mould, and very frequently of fungi, has sprung from the porous mass ; and the decay is always attended with a wide-spreading exhalation.

tion, the odour of which cannot well be described, but which is sufficiently known.

What then are the causes of this destruction? Precisely the same as those which I have before described; though their action is differently modified, and less obvious to gross observation. The decay is produced by the putrefactive fermentation of the component parts of the wood, in connexion with moisture, without which, as I have before stated, wood cannot putrefy.

Common air is not only capable of mixing with a considerable quantity of water in form of vapour, but during every state of our atmosphere is always much loaded with it. Water becomes vapour in consequence of being united with a certain proportion of that substance which is called heat. If a sufficiently cold substance comes in contact with vapour, the superabundant heat, which was necessary to its existence in that form, passes into that cold substance, and the vapour is then immediately condensed or changed into water. Thus if in the hottest day in summer, when the vapour in our breath is totally invisible, we breathe on a looking-glass or plate of polished metal, which is colder than our breath, the surface is immediately dimmed; and if we continue to breathe on it, small drops of liquid appear, which gradually become larger and larger, and many of which at length uniting, run down the surface in a stream. The same thing takes place on the outside of a glass of water drawn in summer from a deep well, and of a bottle brought up into a warm room out of a cold cellar; and on the inside of our windows in frosty weather. On the other hand, we could not dim with our breath a plate of metal or glass of 100 degrees of heat, which is greater than that of our breath, and no mist is observable on the inside of our windows during the heat of a summer's day; nor is there any condensation of moisture on the outside of a glass of cold water fresh drawn from the well, or of a bottle out of a cellar, when either is brought into the open frosty air.

These circumstances will explain many appearances, by which, for want of due examination, we are often greatly puzzled. We are frequently mortified by seeing in our houses, especially in the

country, the walls become stained, or the paper separated and hanging down, and often perishing ; and as this usually happens on the side or corner which is most exposed to the weather, we conclude that the damp comes through the wall, and tax our faculties to the utmost in order to prevent this penetration. The measures which we employ sometimes succeed. But it often happens that casing and plastering and painting the devoted angle fails ; and then, as the last resource, we take off the paper and attach it to canvas at the distance of one or more inches from the wall, and thus, for the present at least, affect the desired purpose. Now in this case it is just as absurd to suppose that the wet comes through the wall, as that it comes through the glass window in a frosty day, or the glass or bottle from the well or cellar. The fact is, that in an exposed house, and more especially on the most exposed corner of a room seldom warmed by fire, the inner surface of the wall, by the continuance of the frost, is become of a very low temperature, like the air within the room itself. So long as this state of equal temperature between the wall and internal air continues, or if the wall is warmer than the air, it is obvious that the vapour which is mixed with that air cannot part with any heat to the wall, and, therefore, will not undergo condensation ; just as no dampness appears on our windows during a hot day in summer. But if a thaw comes on, and the air becomes warmer than the wall, which, from its capacity of easily shifting place, it will readily do, then the vapour, which is mixed with it, parts with its superabundant heat to the colder wall, and appears on it in moisture or drops, or pours down it in streams ; just as happens to the cold bottle brought into the warm dining-room.

This change is the greater, the more completely the materials of the wall fit it for carrying the heat out of the vapour, or, in philosophical language, the better they conduct heat. Hence a wall painted in oil condenses vapour, or runs with water, sooner than one, which, being unpainted, is more porous ; for which reason, in cities, we first perceive dampness and drops or streamlets of water on the oil-painted party walls which bound our staircases,

and which are, therefore, absurdly said to sweat, though these walls have no communication with the outward air, and, from their varnished covering, cannot admit of the passage of moisture or perspiration through their pores.

In this case the remedy is obvious, and by its success shows the nature of the evil. Prevent your walls from ever becoming colder than the warmest external air of winter, and you will never have this appearance of damp on their inner surfaces.

This may be done, first, by constructing the walls of such a degree of thickness, or with such a disposition or quality of materials, that they shall not, in the usual way, be greatly cooled throughout their whole substance by any temperature of the outward air. With this view, I think that in all single houses, which are not warmed by neighbouring fires, and more especially in situations exposed to high winds, and therefore to great evaporation from the external surface, and consequent abstraction of heat, the walls should always be double, having on the inside a thin layer of brick, with an interval of one or two inches from the outer and thicker layer of brick or stone, to which it must be united by proper binders. The porous structure of the bricks, added to the impermeableness of the intermediate stratum of air, would so ill conduct heat, that such walls would necessarily tend to keep a house dry and warm in the winter, as well as cool in the summer. This end would be still further promoted by filling the interval between the two layers with dry sand, fresh sifted coal-ashes, or powdered charcoal. In fact, when the common external means before described have succeeded in curing dampness, it has been either by affording a varnish, which has diminished evaporation by preventing absorption, or by increasing the space or changing the quality of the materials of the wall through which the heat was to pass, so as in either of these cases to retain it more forcibly: and when the dampness has been remedied by removing the paper to some distance from the wall by means of strained canvas, that effect has been produced by rendering the paper a worse conductor of heat; and therefore indisposing it to condense the vapour in the room so readily as when it was in contact with the colder wall.

It has been suggested, that it would be possible to keep out cold, or, in more accurate language, prevent the egress of heat from the inside of a room, and therefore from the walls surrounding it, by shutting it closely up, and preventing any admission of the cold external air. This has arisen from the supposition that air is not a good conductor or transmitter of heat through its substance or pores, but that it merely carries it by changing place with some other portion which was less charged with it. If there were no other mode of abstracting the heat from the walls of a room, and if it were possible wholly to prevent any change of its air, this theory might perhaps apply. But it is not possible to prevent some exchange of this kind through the atmosphere of any habitable chamber; and it is evident from the moisture being most abundantly, or perhaps solely, deposited on the inside of that part of the wall which is most exposed to the external cold, that the chief or common mode in which the wall is cooled is not by the access of cold air into the room, but by the passage of heat from the wall itself into the cold air without. We may however so far avail ourselves of this principle, as to exclude as much cold air as we can, by shutting up the windows and chimnies of uninhabited rooms during the severity of frost.

It may further be suggested, that as, during a thaw, the air, being warmer than the frost, has a greater quantity of water in form of vapour mixed with it, shutting up a room on such occasions may, by retarding the admission of warmer air so charged with vapour, allow time for the walls to acquire an equable temperature through their substance from without, so as to anticipate any condensation on their surface, which might occur from the free admission of the external air. To this I only answer, as before, that rooms according to the common construction cannot be excluded from communication with the external air: and that, in fact, the dampness does under these circumstances take place, though the doors and windows are never opened.

In all cases, however, there is one method of preventing this species of dampness, which is infallible; and that is to keep every

part of the internal surface of the wall in the chamber or staircase sufficiently warm by good fires. With this view all staircases ought to have some means of receiving artificial warmth.

If, notwithstanding this and the former precaution, a wall should accidentally become damp, the next best expedient is to dry it as quick as possible by a free current of warm air.

This discussion, which at first sight might appear tedious and irrelevant, will, I trust, no longer be thought so, when it shall have been found necessary for the establishment of a principle on the subject more immediately before us.

In order to show the analogy, let us take the simplest example, which is that of a wainscoted room, unwarmed by fires. When the wainscot is colder than the air, it condenses the vapour in form of moisture. If that moisture were exposed to the influence of the sun and wind, the case would come under the former head of decay, which is that of wood wetted by rain in the open air. The water soon evaporates, and little decay proceeds in the wood. So in the wainscot, the surface next the room, though unprotected by paint, will perhaps be long in rotting, because the room admits of currents of air, more especially when doors and windows are frequently opened, so as to evaporate the superficial moisture, though less quickly and effectually than in the open air. But what is the case with the surface of the panel next the wall? The air, loaded with moisture, penetrates into the interstitial space, and deposits it by condensation on that surface. But there is afterwards no current of air to evaporate the water so deposited, which then slowly decomposes and destroys that surface of the panel. Such is precisely the process of the dry-rot, which always begins next the wall, and gradually proceeds to the painted or outer surface of the wood. It resembles in its chief circumstances the decay of paper in a damp room; and it resembles that of paper projecting from the wall on canvas, which will still often happen, if the wall be subject to acquire a very considerable degree of coldness, though much more slowly than in the former case.

The same process obtains in all other cases. Whenever the

wood is cooler than the air which it touches, the vapour is condensed upon it; and being exposed to new heat or current of air sufficient again to evaporate it, remains till another fit of condensation affords a new supply.

Thus the process of corrosion and decomposition is continually supported, till the wood moulders away.

The term dry-rot is, therefore, so far from being expressive of the real fact, that decay proceeds under these circumstances more quickly than in the open air, precisely because the wood is more constantly and uniformly wet: just as the lower parts of posts and rails, and any cavities in timber exposed to the weather, rot sooner than those parts which readily and speedily dry.

The smell which we perceive on going into vaults or cellars, where this process is going on, arises partly from the extrication of certain gases, mingled perhaps with some volatile oil, and partly from the effluvia of those vegetable substances, which have already been said to grow on it; and which, though they begin merely because the decayed wood is their proper soil, yet afterwards tend probably to the more speedy decomposition of the wood itself. They cannot, however, with more propriety be said to be the cause of the dry-rot, than the white clover, which appears on certain lands after a top-dressing of coal-ashes, can be said to have produced the soil on which it flourished.

I have remarked above, that sometimes only a particular sort or sample of timber has in certain situations rotted, while another piece has continued for a great length of time perfectly sound. Hence persons have been deceived, and been disposed to attribute the dry-rot solely and universally to some original peculiarity in the wood itself. Dr. Darwin explains this fact by telling us, that the wood so decaying has probably been cut in the spring, when the sap in the alburnum was not only abundant, but of a saccharine quality; which, in combination with the vegetable substance or gluten, disposes it to run with unusual readiness into destructive fermentation. In some trees, as by more particular custom the oak, the bark is a very valuable article of commerce, and is found not only to quit the tree more readily,

but to contain a larger proportion of tan in the spring, when the sap is rising, than at other seasons. Hence an old act of parliament, now in force, ordains that all oak, except for the purpose of building, shall be felled in the spring. Whether doors, posts and rails, paling, barrel-staves, &c. come under the denomination of building, it may be difficult to say; but it seems at first view highly to be lamented that any law should impose an obligation to destroy a valuable species of property. It would indeed be matter of peculiar regret, if an impolitic and avaricious spirit should induce the owners of oak forests to extend the same principle to the timber employed in the construction of great machines, and more especially the British navy.

Various means have been employed in order to remove the tendency to the dry-rot in trees so felled. Thus they have been long exposed to the rain, or steeped, or even sometimes boiled in water, and then dried by artificial heat. These means do not however appear to have been successful in entirely washing out the fermentible sap, which therefore makes them much more subject to the decay of which we are treating. It may however still be doubted whether it acts in any other way than by furnishing a disposition, which requires to be called into action by the same cause which operates in all other cases, moisture.

In proof of what I have stated, I have been informed by one of our Vice-Presidents, that in a large vat or set of vats for beer, belonging to him, the staves formed of oak 2 1-2 inches thick, notwithstanding they were previously steeped in hot water, and then thoroughly dried, in a very short time underwent the dry-rot, while others in the same situation continued unchanged five or ten times that period. It is highly worthy of remark, that the outside of these staves, which was painted, continued sound, and that the decay began on the inside, where, from the vats being at different times more or less filled, they were subject to the joint and successive influence of moisture and air.

I have mentioned above, that the putrefactive fermentation cannot take place except in certain temperatures, the lowest of which, according to Thompson, must be but little below 45 de-

degrees of Fahrenheit's thermometer, and the highest degree which produces dryness by evaporation. The temperature most conducive to this effect has not, so far as I know, been ascertained, though much useful information on this head might be obtained from a set of well-conducted experiments.

The following then appears to be the whole theory of the dry rot; that it is a more or less rapid decomposition of the substance of the wood, from moisture deposited on it by condensation, to the action of which it is more disposed in certain situations than in others; and that this moisture operates most quickly on wood which most abounds with the saccharine or fermentible principles of the sap. Let us see how this theory corresponds with the best known means of prevention, and what more effectual measures it may suggest.

The first point is certainly to choose timber properly felled and well dried. And here, in order to prevent the injudicious fall of large oak timber, it may be of consequence so to know that the bark of such timber contains much less tan than that of the younger and more succulent wood; and that this principle, together with the proper extractive matter, is considerably more abundant in the bark of the Leicester or Huntingdon willow, than in that of any oak. According to the experiments of Mr. Davy, 7 1-2 pounds of the former will go as far in tanning leather as 9 or 10 pounds of the latter. It has however been asserted, that if an oak, or any other tree, which is stripped of its bark, be suffered to stand two or three years before it is felled, the wood will have acquired a very great degree of strength and durability.

Next, where it is practicable, a current of air should be frequently made to pass along the surface of the wood. This expedient seems to have been particularly attended to by the ingenious architects of our Gothic churches, who are said, with that view, to have left various openings in the walls between the two roofs of those edifices. In order also to promote evaporation, a certain degree of heat, such as that of air heated by the sun or fire, should, if possible, be from time to time applied. Cellars themselves ought to have some communication with the outward

air by means of windows and shutters, or trap-doors : and that these may be for a short time opened in proper weather, so as to have a draught of air ; and that no very low degree of temperature is necessary for the preservation of fermented liquors, provided that temperature be uniform, is evident from the practicality of keeping wine extremely well in cellars which are not damp, and in which, therefore, one or both of these circumstances must have taken place.

The destruction of wainscoting may be long deferred by keeping in the apartment suitable fires.

Lastly, the dry-rot may in all cases be infallibly prevented where it is practicable to cover the surface of the wood, properly dried, with a varnish which is impenetrable and indestructable by water. With this view, two or three coats of the composition before described should be laid on the dry wood, before it is erected or put together, and a third or fourth after it is put in its place ; and proper means should be taken thoroughly to dry each successive coat of varnish. In situations of this kind, what means of preservation are necessary must be employed at first ; as it seems scarcely possible to renew them on fixed timber with any chance of benefit.

I do not know whether in very damp situations, surrounded with stagnant air, these varnishes would not in time admit of the growth of fungi or mould. The brimstone might be supposed sufficient to preclude that effect ; but, if we believe Braconnet, seeds of the white mustard sown in pure flower of brimstone, and well watered, became vigorous plants, which flowered and produced effective seeds. It is certain, however, that the essential oil of turpentine will act as a poison on growing vegetables ; and perhaps the same property may exist in rosin, which seems to be a similar essential oil, united with a certain proportion of oxygen.

It is however highly probable, that the union of the brimstone may have another good effect, which is to prevent one of the causes of the destruction of timber which I have before mentioned, the depredations of insects. Whoever would learn the

have; which certain animals of this kind are capable of making in hot countries, would do well to read Sineathman's description of the Termes, or White Ant, originally published in the Philosophical Transactions, and from thence abridged into the English Encyclopedia Britannica, and other collections. In this country we know little of such ravages. Mischief, however, of this kind does sometimes occur, and may be the work of various animals, a particular account of which may be met with in the fifth volume of the Transactions of the Linnean Society.

I am informed, that in India, a circle of Lord Dundonald's coal-tar drawn on the floor round boxes and other furniture, will effectually preserve them and their contents from the depredations of the white ant.

It appears that most insects are fond of sugar and mucilage; which is the probable reason why that wood is most subject to be penetrated by worms, which is felled when it most abounds with sap. In such cases, it might be well to try the effects of washing the wood, previously to the use of the varnish, with a solution of arsenic in hot water, in the proportion of 1 lb. to 10 gallons; or with a strong decoction of coloquintida or bitter apple, or white hellebore; after which the wood must be completely dried before the application of the varnish in the manner before directed. All these preparations are extremely cheap, and are either destructive or offensive to insects, and therefore will, probably, be an effectual defence against any injury from that cause.

ON THE PRINCIPLES

OF IMPROVING

THE BREED OF DOMESTIC ANIMALS,

EVERY one, whose opportunities have permitted, must have remarked, that the agriculture of Pennsylvania has very materially improved in the course of the last twenty years. This

change has been effected by the free use of lime, gypsum,* and the introduction of green and root crops, and their alternation with those of grain, by which means abundant food for all domestic animals is furnished, manure rapidly accumulated, and the strength of the land kept up. It cannot however be denied, that in all kinds of farm cattle, there is much room for improvement, and that in respect to fine neat cattle, our deficiency is very great. With a view therefore to assist those who are anxious to undertake the important and profitable measure of improving their stock, the following hints are given. They are the result of remarks of professed breeders and improvers in England,† tested by the experience and observations of the Editor, and other members of the Cattle Society of Pennsylvania.

Until about fifty years since, no attempt had been made to change the state of farm cattle in England. Before that time, all country possessed animals of worse forms. Size was the only object of consideration, and form was never taken into view. Hence large big boned, coarse headed, narrow rumped animals were the fashionable stock of the day. Some of those worthless beasts were imported into the United States before the revolutionary war, but they are now happily extinct. They are still abundant in England, as appears by Mr. Nicholson's letter in page 295.

A few ingenious and observing men, perceiving the loss sustained in feeding such animals, commenced the attempt to alter their forms, selecting and breeding from what they deemed the best shaped without regard to bulk. Mr. Bakewell of Dishley, in the county of Leicester, continued to advance the desirable properties of the race upon which the experiment was first made,

* For a full account of the fertilizing effects of gypsum on grass, and on other vegetables, its mode of application, &c. see the Treatise of Mr. Peters on Gypsum, the Memoirs of the Agricultural Society of Philadelphia, vols. 1—2. and the Domestic Encyclopædia, Philadelphia edition.—For remarks on lime as a manure, see the two last mentioned works.

† The authorities consulted, besides those quoted, are Lord Somerville, China on the form of animals; Lawrence on Cattle, and Sir John Sinclair.

and since his time, others have followed with great success, and have found out in what respects, even the favourite forms of that original character might be altered for the better. "Mr. Bakewell, after breeding *in and in*, through a great number of descents, ever selecting individuals of the roundest form, and smallest bone, raised that variety which has been since so celebrated for aptitude to acquire external fat. But, in the attainment of this end, he sacrificed the quality of great milking, and rendered the animals less certain in the faculty of procreation."* The fat moreover, not being diffused through the flesh, but lying in thick layers externally, was a great objection, as much waste necessarily ensued in cooking. The same thing occurred in the Bakewell or Dishley sheep, on the ribs of which the fat has often measured seven inches, while the flesh was not one inch thick. These defects led to further experiments, and occasioned the origination of other breeds, some of which shall be noticed in the sequel.

The first object that naturally offers to be attained, is the possession of a breed of cattle, which, with a given quantity of food, will afford the quickest and greatest return of the most valuable parts of flesh, or of milk or butter. After repeated experience and close attention to the subject, by European improvers, it has been found, that so far as flesh is concerned, there are certain forms and proportions of body, intimately connected with the great object in view, and these shall now be detailed.

1. Of a Bull.—The head should be rather long, and small, muzzle fine,† chaps clean, eyes lively and prominent, ears long and thin, horns tapering, bright and spreading; neck *fine*, rising with a gentle curve from his shoulders, and small and fine where it joins the head, progressively leading down to a full and deep bosom; shoulders moderately broad at the top, joining full to the

* Lawrence on Cattle, page 62.

† Lord Somerville, who does all his farm-work with Devon oxen, says, that with respect to that particular breed, "a black nose is often a sign of a bad constitution, of such as turn scourers, and particularly when the cast of the coat is of too pale a colour." It may be well for the American improver to notice how far the remark applies in this country.

chine [crops] and chest ; breast broad, and projecting well before his legs ; his arms or fore-thighs muscular and tapering to his knee ; his legs clean, straight, and very fine boned, and standing wide ; his chine and chest so full as to leave no hollows behind the shoulders ; the plates strong, to keep his belly from sinking below the level of his breast ; his back or loins broad, straight and flat ; his ribs rising one above another, in such a manner that the last rib shall be rather the highest, leaving only a small space to the hips, the whole forming a round, barrel-like, but capacious carcase : his hips should be wide, round, and a little higher than the back ; the rump wide, and lying in a horizontal direction, and not sinking backwards, but even with the general level of the back ; the huckle bones [rump bones] not in the least protuberant ; the tail should be thin, round and tapering, not hairy, and set on so high as to take in the same horizontal line with the back : it should moreover be broad at bottom, to prevent the appearance of the cavities at the nache : and the gristles at the setting on of the tail should rather project on each side, as they accumulate much fat in this part. The skin should be mellow and elastic, yielding pleasantly to the touch, especially on the chine, shoulders and ribs ; feeling soft, though firm to the touch, and equally distant from the dry hard skin, or loose flabby feel.

As some reasons may be expected for the minuteness of this description, the following are offered.

A small head facilitates birth ; if it be not neatly let into the line of the neck, and if the points of the shoulders push downwards, the neck appears out of proportion, the weight or strength which ought to be in the closing or junction of the shoulders at the top is destroyed, and the end of the chine at that part is thin and hollow, and the due symmetry of the part is destroyed. An animal with a dull eye rarely fattens well. The loins being narrow and thin, and the feet standing close, are signs of weakness, and very unsightly defects : when the fore-legs approach too near, it may be also presumed from the consequent narrowness of the chest, that there will not be sufficient room for the action of the lungs, during the period of fattening, and as on their size and

soundness, the strength and health of the animal, and his power of converting food into nourishment principally depend, it is of the first importance to attend to the formation of the chest.* If a bullock is in-kneed, or the knees bend inward, the points of the toe and of the shoulder must be out; and he must be hollow behind the withers (a bad point for feeding), and he will, of necessity, be a slow worker. A hairy tail is indicative of a hairy head and large bones, and of a coarse opened grain flesh, or "gumminess."

The pelvis is the cavity formed by the junction of the haunch bones, with the bones of the rump. It is essential that this cavity should be large in the female, that she may be enabled to bring forth her young without difficulty. The size of the pelvis is chiefly indicated by the width of the hips, and the breadth of the twist, or the space between the thighs. The breadth of the loins is always in proportion to that of the chest and the pelvis. Small boned animals invariably fatten quicker than those of larger bones, which often are the result of an imperfect nourishment during growth, and generally indicate an imperfection in the organs of nutrition. When a hide feels soft and mellow, it strongly indicates a tendency to take on meat, and it is evident, that a fine and soft skin must be more pliable, and more easily stretched out to receive any extraordinary quantity of flesh, than a thick or tough one. At the same time, thick hides are of great importance in various manufactures, and are necessary in cold countries, where cattle are much exposed to the inclemency of the seasons; and in the best breeds of Scotch Highland cattle, which are much prized in England, the skin is thick in proportion to their size, without being prejudicial to their capacity of fattening.

Finally, whatever be the size of the animal, just and equal proportions of length, depth and substance, are the truest indications of vigour, and of the ability of the animal to produce and stand under the greatest possible load of flesh.

* Cline on form of animals.

form, will be greatly preferable, either for the purposes of labour, or of food to mankind. I have seen this difference in the influence of the male and female parents on the offspring, very strikingly exemplified, in the result of an attempt to obtain very large mules from the male ass, and the mare. The largest females, that could be procured, were selected, and the forms of the offspring, at the birth, were perfectly consistent with the theory of Mr. Cline; they were remarkably large, and I observed, that the length of their legs, when they were only four days old, very nearly equalled that of the legs of their parents. I examined the same animals when five years old, and in the depth of their chests and shoulders, they very little exceeded their male parent, (a Spanish ass) but from mares of small stature, were perfectly well proportioned.*

“There is another respect in which the powers of the female appear to be prevalent in their influence on the offspring, and that is relative to its sex. In several species of domesticated, or cultivated animals, (I believe in all) particular females are found to produce a very large majority, and sometimes all their offspring, of the same sex; and I have proved repeatedly, that, by dividing a herd of thirty cows into three equal parts, I could calculate, with confidence, upon a very large majority of females from one part, of males from another, and upon nearly an equal number of males and females from the remainder. I frequently endeavoured to change these habits, by changing the males, but always without success; and I have, in some instances, observed the offspring of one sex, though obtained from different males, to exceed those of the other, in the proportion of five or six, and even seven to one. When, on the contrary, I have attended to the numerous offspring of a single bull, or ram, or horse, I have never seen any considerable difference in the number of offspring

* It is probable that different species of animals differ in respect to the influence of the size of the parents on their progeny. I have known a pair of noble carriage horses, got out of a diminutive mare, by a large and well formed horse; while, on the contrary, in the case of sheep, the influence of the size of the mother upon that of the young, is certainly great, as already stated, p. 90. EDITOR.

of either sex. I am therefore disposed to believe, that the sex of the offspring is given by the female parents.”*

Mr. Knight is well known for his attentive and successful investigations of nature, animal and vegetable, and his conclusions have, in this case, he says, been drawn from very extensive and accurate observation.

To obtain the most approved form, two modes of breeding have been practised, one by the selection of individuals of the same family, called breeding, “*in-and-in* ;” the other, by selecting males and females from different varieties of the same species, which is called “*crossing the breed*.”

When a particular variety approaches perfection in form, breeding *in-and-in* may be the better practice. In following this, however, great caution is requisite in selecting the best shaped individuals. It was thus, the celebrated *Bakewell* preserved his various stock, without degeneration in any of the qualities for which they were famous. But as, in the United States, the origination of a breed of neat cattle is to be aimed at, the system of crossing must be adopted, and for this end, the following rules should be attended to.

Mr. Lawrence remarks: “Individual variety of size and shape prevails in all breeds, to the infinite use and convenience of man. Some will run naturally to length and depth of carcase ; others, will have a tendency to the contrary form, or with much substance, wide loins, and short legs. The improving breeder, in joining the sexes, will take advantage of these varieties of shape or peculiar properties ; increasing length and depth of carcase, when required, or moderating too great length with its opposite,—with rotundity of form, and width of loin, and shortness of leg ; ever having especial regard to preserving *substance* in the form of his stock, and to prevent the increasing length and too near approach of the legs. It is very common for the best breeds to degenerate in this way from neglect ; in which case it will be necessary to change the males for others of a still shorter and more substantial form, either from the same or a kindred variety, and to pay an increased attention to the selection of females.”

* Transactions Royal Society London, 1810.

Disposition. "It is of great importance to have a breed distinguished by a tame and docile disposition, without however being deficient in spirit. Such a breed is not so apt to injure fences, to break into fields, and unquestionably less food will rear, support and fatten them. As tameness of disposition is much owing to the manner in which the animal is brought up, attention to inure them early to be familiar and docile, cannot be too much recommended."* Mr. Bakewell attended sedulously to this point; and his breed of cattle retain it to this day. He kept them in stalls, and attended them with the same care that others do a favourite horse. A bull of his stock, exhibited at the Cattle Show, in April last, by Messrs. Ely and Eastburn, was as gentle as a cart horse.

Hardiness. "This is a most important requisite. Even where stock is most attended to, it is of essential consequence that they should be as little liable as possible to disease, or any hereditary distemper, as being black fleshed, or having yellow fat. It is a popular belief, that a dark colour is an indication of hardiness, and that cattle with light colours are softer and more delicate. A rough pile is also reckoned a desirable property in *out-winterers*."

Easily maintained. "On an attention to this point depends the profit, in a great measure, of the grazier. It is intimately connected with the shape above mentioned, and with smallness of bone." In the horse, every one knows that certain shape is indicative of being easily kept, and the remark will apply to neat cattle.

Early maturity. "Arriving soon at perfection, is a material object for the breeder, as his profit must in a great measure depend upon it."* Something will certainly depend upon their being fed in such a manner as to keep them constantly in a growing state: in this way, they make more progress in three years, than they usually do in five, when they are half starved during winter, and their growth checked. By the letter (page 294) from Mr. Nicholson, of Gipton, near Leeds, in England, it ap-

* Sir John Sinclair—Farmer's Magazine, vol. 3.

pears that his breed of cattle possesses this valuable requisite in a most remarkable degree. His bull, which was sold for 100 guineas, weighed 2240 lbs. live weight at three years and two months old. His fore quarters were supposed to weigh 1560 lbs. He was kept for cows, and it is probable had only common pasture, when weighed. Six beasts, three years and a half old each, sold for 38*l.* 6*s.* sterling each, or \$ 170 22. The four quarters of each weighed 1316 lbs. In this country, such weights would be thought great in beasts of five years old, which had been well wintered, grazed the following summer, and stall-fed in the succeeding winter.

Let the spirited breeders on our frontiers make a calculation, as to the great increase of price they would obtain from the grazer, for cattle coming so early to maturity as those just mentioned and reflect on the profit from selling their poor cattle at two years of age instead of five or six years; and let the grazer calculate the difference to him between keeping cattle one year, instead of fifteen or eighteen months, and the saving of some hundred bushels of corn meal by stall-feeding, and then say, whether there is not room for improvement in our stock.

Quality of flesh. "The quality of flesh most certainly depends much upon age, and sex; heifers, for instance, must be finer grained than oxen;" and the coarseness of stag beef is proverbial. The excellence of the meat also greatly depends upon their food, and the nature of the soil producing it. On the whole, there is no better sign of good flesh, than when it is marbled, or the fat and lean nicely and alternately mixed with each other. The person who would, in the United States, originate a breed, in which we might always be sure of finding such beef, or who would discover the particular marks by which such cattle might be known, would deserve one of the highest premiums our Cattle Society could bestow, and be otherwise well paid for his trouble.

Working. In the case of working oxen, a quick step, and strength in proportion to speed, are of the greatest importance; and that these qualities may be imparted to an ox, there can be little doubt. In England, they are supposed to have been ob-

tained by an admixture of the lighter, small boned French, Norman or Guernsey breed, with some of the native breeds. Their gentleness of disposition, mildness and hardihood, also serve to recommend the French breed. When well kept, they grow to good sizes, although naturally small.* In the U. States, a great diversity is found in respect to the gait of oxen; for while some are slow, others will walk nearly as fast as a horse. The formation of their fore-quarters, as before noted, will greatly influence their speed. If a breed could be originated, which, with the above mentioned qualities, this of quickstep were joined, a great object would be obtained, and would amply repay the breeder.

It may be asserted with safety, that in no country does the dairy-man receive greater prices for his milk, butter or cheese, than in the United States; and yet it is notorious, that the cows in general are far from excellent. The abundant provision required for the support of stock, during our long winters, ought to insure a plentiful supply of rich milk in summer, and yet it is believed that the profit from them is much smaller than is commonly imagined. We are much more deficient in this article of farm stock than in any other, which calls loudly for the attention of the improver. The indications of form, which so strongly characterise the profitable cattle for beef, fail with respect to milk, as we find that some of the most excellent milk breeds are very different in external form. The surest mode of procedure for the improver, is to breed from good milkers, that is, such as give rich milk, and if possible, from such as possess the forms approved of for bulls in the preceding pages, making allowance for the difference of sex. There are, however, some marks of a good milch cow, in every breed, which it may be useful to note, viz. a capacious and thin-skinned udder, large

* In France, oxen are very generally used to plough and for draught. It is probable therefore they are more speedy in their gait than the native breed of England, or than the common breed in this country. Some of those French breeds have been introduced into England, and much admired. See *Bath Memoirs*, vol. ix. introduction, p. 33, and *Commercial and Agricultural Magazine*, London, Vol: 9. p. 292.

teats, with a large and distinct milk-vein ; fine head and chaps, thin neck, shallow and light fore-quarters, capacious behind, wide loin, thin thigh, and white horns. A gaunt and meagre appearance of body, promising no great disposition to fatten, is added by some as a sign of a good milker ; but although good milkers are often of a thin habit, yet there can be no reason why the rule should be absolute ; and on the contrary, we see in Tuke's survey of Yorkshire, portraits of Teeswater cows, that must from their formation take on fat readily, and they are well known to be first rate milkers.

To shew the inferiority of the produce of our cows, when compared with those of England, a few facts shall be stated. Sir John Sinclair* states, on the authority of W. Trevalyan, Esq. of Northumberland, that a well bred Teeswater cow will give on an average 14 quarts at each of two milkings, or 28 quarts per day. Some of the Teeswater breed, according to Culley,† give even to the amount of 36 quarts per day. The cows of the island of Alderney, and other islands on the coast of France, give very rich milk, though not in the greatest quantity. Lawrence says,‡ “ he was assured by a respectable friend, that an Alderney strayed cow, during the three weeks she was kept by the finder, made nineteen pounds of butter each week, and the fact was held so extraordinary as to be thought worth a memorandum in the parish books.” A cow of the same breed was imported into Philadelphia by Mr. Charles Ross, and in his possession she made nine pounds of butter every week. Cows from north Devonshire, keep in good order, are hardy, their beef is fine grained, and they are so easily maintained, that one acre and a half of prime pasture is the allowance for one cow a whole year, during which time each cow will fatten five calves.§ A Sussex bred cow

* Farmers Mag. Edinb. Vol. 3.

† On Live stock, p. 40.

‡ Lawrence on cattle, p. 87.

§ The business of purchasing calves from the London cow keepers, and taking them to the country for the purpose of fattening for market, is followed by many persons within a few miles of London.

owned by Mr. Cramp of Lewes, cleared one year 43*℥*. 5*s*. 11*d*. and the second year 30*℥*. 16*s*. 1*d*. as stated in p. 289—290.

To those who have been contented with the common cows brought to them by drovers, or picked up in the neighbourhood, and the extent of whose travels has been from market back to their farms, and to an election ground, and who despise all information derived from books, some of the facts just mentioned will pass for fable; but of their authenticity there can be no doubt: the fact respecting the production by the Alderney cow may at any time be verified, and in order to be assured that it is possible to have better cows than their own, they need only visit Mr. A. Deveas, and Mr. Shukert of Germantown near the Drover tavern, where they may see two cows which give from 10 to 12 lbs. of butter every week: and Mr. G. Hoppel lately had a cow which gave 15 lbs. of butter a week.

These facts ought to convince every one who is anxious to make the most of his farm, of the great room there is for improvement, and should rouse him to the attempt.

The combination of the valuable properties in a breed of milk, and beef, is so important, and has been thought to be so difficult of attaining, that it has been recommended not to attempt the union, for in proportion as we gain in one point, we lose in the other. We know in general, that good milkers are seldom quick feeders. The two objects have however been accomplished to a certain extent in England, in the case of the North Devon cows,* and in some individuals of the Kyloe or Highland breed,† and in the Suffolk Duns; and there is no reason why the same success should not attend equal industry in this country. Mr. Cramp's cow before noticed, was always ready for the butcher, but then other food besides grass was regularly given to her. It has been said indeed, by some, to be the result of their remarks, that "the cow which gave the greatest quantity of butter in a given time fed fastest when dry;"‡ but that the remark did not apply to *thin* milkers.

* Commun. Board of Agriculture, Vol. 4, p.

† Anderson's Recreations, Vol. 3d, p. 95—96.

‡ Farmer's Magazine, Edinb. Vol. 7, p. 177.

It is to be regretted that opportunities for the improvement of stock of neat cattle by means of the improved breeds of Europe are so few, and that even the knowledge of the existence of any among us is so partially diffused. It is understood that some very high priced cattle were imported into Maryland before and since the revolutionary war from Europe; and that within a few years past, more have been imported into the frontier parts of the state of New-York, but their particular qualities are scarcely known beyond the immediate vicinity in which they were introduced.* A breed from Holland, very valuable for milk and beef was imported some years since into Philadelphia, but the original stock was killed before the full blood was obtained. His progeny however evince such qualities as lead us to consider his death as a national loss. The original sire was sent to Lancaster county, where only a few of the first cross from him remain. Six steers of his stock which were fattened in the neighborhood of Lancaster during the year 1808, were pronounced by a competent judge† to be the handsomest cattle he ever saw. The fine ox fed by Mr. Guyer, and killed in Philadelphia, March 1808, was from a cow of that breed, by an English bull, now or late in the possession of Mr. Bunting of Neshaminy.

In the scarcity therefore of good foreign breeds, we must have recourse to our native stock, and it is a great satisfaction to know that there are excellent materials among us, on which we may commence the attempt. We every year see beasts of good form brought down in droves from various quarters, and sacrificed, after performing their duty for a season in a herd of cows; and which if kept as breeders would naturally improve the stock of the district. As a general rule, let no offspring be raised ex-

* Information respecting those cattle or any other valuable breed in the United States, will be thankfully received by the Editor. Parkinson the English, farmer who came to this country a few years since, and settled near Baltimore, also brought with him some stock, which were sold on his failure:—it would be desirable to know what are their merits.

† Thomas Smith, Esq. of Tinicum.

cept from the finest boned, cleanest headed, straight backed, and best fleshed of every stock, both male and female.*

A close adherence to those principles of choice at home, and in occasional purchase at markets, will soon convince any man how striking the improvement of his stock might become in a few years, and we look forward with great satisfaction to the period when the effects of our recommendation shall be shown.

Sir John Sinclair sums up the desirable qualities of cattle as follows.

1. A moderate size, unless when food is of a nature peculiarly forcing.

2. Shape the most likely to yield profit to the farmer.

3. Of a docile disposition, without being deficient in spirit.

4. Hardy, and not liable to disease.

5. Easily maintained, and on food not of a costly nature.

6. Arriving soon at maturity.

7. Producing considerable quantities of milk.

8. Having flesh of an excellent quality.

9. Having a tendency to take on fat.

10. Having a valuable hide. To which may be added,

Lastly, calculated (if judged necessary) for working.

2d. *Of a Ram.* The head should be fine and small; the eye prominent and lively, the ears thin, but not regular, the collar full from the breast and shoulders but tapering down; the shoulders should be broad and full, joining to the collar forward, and a chine backward in a straight line, so as to leave no hollow in either place; the mutton upon the fore thigh should come down to the knee, the legs should be straight, with a fine clean bone,

* The late Colonel Pollen, a British officer, and well informed on the subject of cattle, passed through the United States in 1802, and mentioned in a note to a gentleman of Philadelphia, that he saw "a breed of cows near Lancaster, with a fine small head, smooth and delicate hair, small eye, round rib, and straight back, which would be an acquisition to England if introduced there." This remark, made by an intelligent foreigner, who was well acquainted with the improved breeds of England, ought to have its due weight, and should stimulate us to attend to the animals we meet with, which may possess some valuable properties.

free from superfluous skin and coarse hairy wool, from the hough and knee downwards: the breast should be broad, and project well before the legs: the fore legs should be wide asunder; the back and loins broad, flat and straight, and from the ribs should rise in a circular direction; the hind quarters should be long and full, with the mutton down to the hough, which should be wide and rather boning out.* In the Merino race a rosy hue in the skin, and abundance of yoke or natural grease in the fleece, are peculiarities denoting health and high proof.

Wool is divided into two kinds, viz. long or combing, and the short or carding species, in both cases the thicker and finer the fleece the better. The particular species whether long or short woolled, having become fixed on, it will be found best to adhere thereto, and not to cross with a view to the division of properties. Thus an attempt to produce a mixture of the long and short woolled breeds, might in all probability disappoint expectation, and not be useful for either combing or carding. Length of staple in the long woolled breed, and fineness, elasticity, and closeness in the short-woolled fleece, will be the best guides in this case.

In all cases the carcass of the animal ought to be amply and regularly covered; it is a great defect when the belly is bare, as is too often the case with the American sheep, and a still greater when the wool is thin and open along the ridge of the back,† admitting rain which washes out the yoke or natural grease and chills the animal. At shearing time, notice should be taken of the fleece when cut off, and if it be stichy-haired at the bottom or part of separation, it should be marked for fattening. In the formation of a stock, such sheep should be avoided. In a general way, those should be chosen for breeders that have the finest, closest pile or thickest fleece, and have the greatest uniformity in the texture of the whole fleece, and are in the best condition at the time, provided the pasture has been nearly equal.

In various parts of the United States, sheep of good forms and valuable fleeces are to be seen; but few persons have attended to

* Culley on live stock.

† Lawrence, p. 303.

the preservation of their stock, with that care which a measure so important deserved. Within a short time, however the eyes of the public have been opened, and it is to be hoped that the debasement of a valuable stock by the neglect and unrestrained intercourse with inferior rams, will be not longer permitted. Those anxious to improve, should make it a point to preserve the best formed and most thriving of their lambs for breeders, whether ewes or rams, and carefully put away, or fatten all those of inferior forms or of less thrifty dispositions.

Of imported sheep we have four kinds, and all valuable. viz. Spanish or Merino, Broad-tailed or Tunis, Irish, and New Leicester breeds, on each of which a few remarks shall be made.

The Spanish or Merino sheep are universally known for the superior fine quality of the wool, and it is agreeable to know that so far from degenerating in this country, the improvement in fleece is evident in proportion to the increase of blood.—It is a fact that upon some occasions, the very first cross between the Spaniard and American ewes gives lambs, which in the course of even the first year attain to a greater size than the sire:—that the mutton is excellent; that the crosses fatten in much less time than the common sheep of the country:—that they are very hardy, healthy, and do not become sick when fat, nor are they affected by the pelt rot, like our native sheep in winter, if kept in good heart, (as they always should be); nor do they shed their wool in the spring; that their bodies are completely covered, and lastly, that the ewes make excellent nurses.

It may be necessary to repeat to the American improver, that no judgment can be formed with respect to the ultimate quality of the wool or forms of this breed from the appearance of the lambs, until they are upwards of a year old; and for this reason, no males of the higher bloods should be sold, until the second year, unless they are defective in form.

The facts stated with respect to the importance of the female in all attempts to improve form, particularly apply to the case of sheep. One objection to the Merino breed, which frequently has been offered by those who consider size as all impor-

tant in cattle, is the general diminutive appearance of the full blooded rams. But it should be known, that it is upon the mother, we must principally depend for an increase of carcase, and for improvement of form. The sire gives the fleece; a due attention therefore to the size and form of the ewes in the formation of a flock, is of the first consequence to insure success. These principles, hitherto but little known in this country, will probably admit of controversy, or excite doubts, but their accuracy has been repeatedly demonstrated by the experience of numerous intelligent breeders, and by all those European improvers, who have favoured the public with the result of their experiments and observations.

The idle notion, that Merino sheep can produce fine wool only in Spain, has been amply disproved by Lasteyrie, and by the result of the experience of the English and American improvers.

In France, owing to the care taken to provide plenty of food at all times; to the selection of the largest and best formed and finest woolled ewes and rams for breeders; and to not using either until the second year; the flock of the national farm have been brought to carry finer and heavier fleeces, and to be better formed than any in Spain. The long journies which the Merino breed in Spain are obliged to take, to procure food every day, owing to the numbers kept together, and which are absurdly supposed to contribute to the preservation of the fine quality of the wool, tends on the contrary to diminish their size, and injure the wool; for instead of laying down to chew their cud, after they have filled their stomach, they are forced to march several miles, and "by this forcible deviation from the laws of nature, their digestion is impeded, and nutrition, and consequent growth, is proportionably defective."*

The Merino race affords a variety of advantages over every other kind of sheep, and ought therefore under the present circumstances of the country, to demand the first attention from our farmers. Mr. Livingston has remarked, and with great

* Parry, page 467.

truth, that wool, in the United States is more valuable, and is certainly more scarce than meat; while the contrary is the case in Europe, and particularly in England. Merino wool sells from 75 cts. to 2 dolls. per lb.; and from the increasing number of manufactories in the United States, will for many years command those prices; for the consumption of fine cloth will increase in proportion to the readiness with which it can be obtained. But the fact is, as already stated, that this breed having a fair chance, yields good mutton, as well as good wool.

The Barbary breed of sheep with broad tails, carry good and long wool, and fatten easily and to desirable weights.*

The Irish breed is confined principally to the vicinity of West Chester in this state: they fatten to great weights at three years old.

The possession of the new Leicester sheep may be justly deemed a treasure to the United States, where from great inattention, most of the breeds formerly among us have become worn out, so that they are difficult to fatten, and have degenerated in form.—

We owe the introduction of this valuable breed to the spirit and exertion of——, Beans, now of New Jersey, who succeeded in shipping some rams and ewes from England, a few years since; the full-blood descendants of which are exclusively in the possession of Capt. Farmer of New Brunswick, New Jersey. But their progeny is distributed throughout the state of New Jersey, and a part of Pennsylvania.

The barrel shape of the bodies of the New Leicesters, their very gentle disposition, and natural indolence, cause them to take on fat very speedily, and hence answer admirably to cross with the narrow backed, flat sided, long legged breeds. The objection to the full breed in England is the same that is made to all the stock of Bakewell, viz. a too great tendency to take on external fat without a due proportion of lean. This objection will not apply to the cross with most of the American sheep, in which all addition of fat may be considered as clear gain. The

* For a more particular account of this breed, see memoirs of the Agricultural Society of Philadelphia.—Vols. 1—2.

object to be aimed at by the assistance of the new Leicester sheep, is the origination of a breed by crossing with our native stock, which will increase the tendency to speedy fattening, without diminishing the due proportion of flesh, so desirable in all stock, and to this object I beg leave to direct the attention of the American improver.

SWINE.

A great diversity of breeds of Swine are found in all parts of the U. States, some of which are highly valuable, and others very worthless. Several persons within my knowledge have hogs which at 15 and 18 months old, will weigh 300 lbs. and upwards. Of the foreign breeds near Philadelphia, only two are distinctly and accurately marked, viz. the African and Chinese. The first is most commonly white, of good shape, wide behind, small pointed ears, and a pouch on each jaw. They will fatten with less food than almost any other breed; have very thin skins, and very small bones: at four weeks old will weigh ten and a half lbs.; hence they take the lead as roasters in our markets. At 18 months they will weigh from 150 lbs. to 250 lbs., but are ripe with good keeping at 12 months.—The objection to them is, that they incline too much to fat, and throw it on the outside, and do not marble the flesh, and hence are most fit for the labouring class. When deep in the blood, they become so fat, merely by grazing and having the common slops of a farm, as to diminish their disposition to procreation. For these reasons, a cross with some of the common breeds forms an evident improvement, for more flesh is thus acquired, than is possessed by the African, while the superior tendency of the latter speedily to take on fat, is what our common breeds are lamentably deficient in. In this way, I have produced a stock of hogs the beauty of which cannot be exceeded. I regret that I omitted to record the particular weights of several parcels of hogs I have killed, but I am glad to be enabled to supply my deficiency by the following statement from Job Roberts Esq. of Montgomery County Pennsylvania, no less known for his excel-

lent farming and zeal for improvement, than for his accuracy, and the upright discharge of his duty as a magistrate.

"Last autumn (1808) says he, I killed nine hogs, which weighed 1956 lbs.; one of them was two years and three months old, and weighed 321 lbs. the other eight were fifteen or sixteen months old, and averaged upwards of 200 lbs. each; for the last six months before penning, they had no kind of grain whatever, and but little milk, (that being given to small shotes for the market) they subsisted on clover and other grass, as they run with my cows during the summer; two or three weeks before penning, I gave them plenty of pumpkins, and after penning, gave them twenty bushells of corn to harden their meat. I am of opinion that the food required to raise and fatten the said nine hogs, would not have been sufficient to have made 1000 cwt. of pork of any other kind of hogs that I have had, and I have generally endeavoured to obtain the best."

The Chinese hogs are invariably black, fatten easily, are smaller than the African, are very prolific, have thick skins, hollow backs and pendant bellies almost touching the ground; their tails are curled and in perpetual motion.—It is extremely desirable to originate a breed which shall partake of the disposition to fatten speedily, and at the same time will diffuse the fat through the flesh.

I shall conclude the subject of the improvement of the breed of cattle, by the following observations of Sir John Saunders Sebright, Bart. M. P. contained in a small pamphlet* recently received by the Editor.

"WERE I to define what is called the art of breeding, I should say, that it consisted in the selection of males and females, intended to breed together, in reference to each other's merits and defects.

It is not always by putting the best male to the best female; that the best produce will be obtained; for should they both have a tendency to the same defect, although in ever so slight a degree, it will in general preponderate so much in the produce, as to render it of little value.

* "The art of improving the breed of domestic animals, in a letter to Joseph Banks, K. B. by Sir John Saunders Sebright, Bart. M. P.—London—Harding, 1809."

A breed of animals may be said to be improved, when any desired quality has been increased by art, beyond what that quality was in the same breed, in a state of nature: the swiftness of the race-horse, the propensity to fatten in cattle, and the fine wool in sheep, are improvements which have been made in particular varieties of the species to which these animals belong. What has been produced by art, must be continued by the same means, for the most improved breeds will soon return to a state of nature, or perhaps defects will arise, which did not exist when the breed was in its natural state, unless the greatest attention is paid to the selection of the individuals who are to breed together.

We must observe the smallest tendency to imperfection in our stock, the moment it appears, so as to be able to counteract it, before it becomes a defect; as a ropedancer, to preserve his equilibrium, must collect the ballance, before it is gone too far, and then not by such a motion, as will incline it too much to the opposite side.

The breeder's success will depend entirely upon the degree in which he may happen to possess this particular talent.

Regard should not only be paid to the qualities apparent in animals, selected for breeding, but to those which have prevailed in the race from which they are descended, as they will always show themselves, sooner or later, in the progeny: it is for this reason that we should not breed from an animal, however excellent, unless we can ascertain it to be what is called *well bred*; that is, descended from a race of ancestors, who have, through several generations, possessed, in a high degree, the properties which it is our object to obtain.

The offspring of some animals is very unlike themselves; it is, therefore a good precaution, to try the young males with a few females, the quality of whose produce has been already ascertained: by this means we shall know the sort of stock they get, and the description of females to which they are the best adapted.

If a breed cannot be improved, or even continued in the degree of perfection at which it has already arrived, but by breeding from individuals, so selected as to correct each other's defects,

and by a judicious combination of their different properties, (a position, I believe, that will not be denied,) it follows that animals must degenerate, by being long bred from the same family, without the intermixture of any other blood, or from being what is technically called, *bred in-and-in*.

Mr. Bakewell, who certainly threw more light upon the art of breeding than any of his predecessors, was the first, I believe, who asserted that a cross was unnecessary, and that animals would not degenerate, by being *bred in-and-in*, which was at that time the received opinion.

He said, you could but breed from the best. Of this there can be no doubt; but it is to be proved, how long the same family, *bred in-and-in*, will continue to be the best.

No one can deny the ability of Mr. Bakewell, in the art of which he may fairly be said to have been the inventor: but the mystery with which he is well known to have carried on every part of his business, and the various means which he employed to mislead the public, induce me not to give that weight to his assertions which I should do to his real opinion, could it have been ascertained.

Mr. Meynell's fox-hounds are likewise quoted as an instance of the success of this practice: but, upon speaking to that gentleman upon that subject, I found that he did not attach the meaning that I do, to the term *in-and-in*. He said, that he frequently bred from the father and the daughter, and the mother and the son. This is not what I consider as breeding *in-and-in*; for the daughter is only half of the same blood as the father, and will probably partake, in a great degree, of the properties of the mother.

Mr. Meynell sometimes bred from brother and sister: this is certainly what may be called a *little close*: but should they both be very good, and, particularly, should the same defects not predominate in both, but the perfections of the one promise to correct in the produce the imperfections of the other, I do not think it objectionable: much further than this, the system of breeding from the same family cannot, in my opinion, be pursued with safety.

Mr. Bakewell had certainly the merit of destroying the absurd prejudice which formerly prevailed against breeding from animals between whom there was any degree of relationship: had this opinion been universally acted upon, no one could have been said to be possessed of a particular breed, good or bad; for the produce of one year would have been dissimilar to that of another, and we should have availed ourselves but little of an animal of superior merit that we might have had the good fortune to possess.

The authorities of Mr. Bakewell, and of Mr. Meynell, being generally quoted, when this subject is discussed, I have stated, why I reject that of the former altogether, and that the latter, in point of fact, never fairly tried the experiment.

I do not find that any of the many advocates for breeding *in-and-in*, with whom I have conversed, have tried it to any extent; they say, that it is to perfect animals only that the practice applies, but the existence of a perfect animal is an hypothesis I cannot admit.

I do not believe, that there ever did exist an animal without some defect, in constitution, in form, or in some other essential quality; a tendency, at least, to the same imperfection, generally prevails in different degrees in the same family. By breeding *in-and-in*, this defect, however small it may be at first, will increase in every succeeding generation; and will, at last, predominate to such a degree, as to render the breed of little value. Indeed, I have no doubt but that by this practice being continued, animals would, in course of time, degenerate to such a degree, as to become incapable of breeding at all.

The effect of *breeding in-and-in* may be accelerated, or retarded by selection, particularly in those animals who produce many young ones at a time. There may be families so nearly perfect, as to go through several generations, without sustaining much injury, from having been bred *in-and-in*; but a good judge would, upon examination, point out by what they must ultimately fail, as a mechanic would discover the weakest part of a machine, before it gave way.

Breeding *in-and-in*, will, of course, have the same effect in strengthening the good, as the bad properties, and may be beneficial, if not carried too far, particularly in fixing any variety which may be thought valuable.

I have tried many experiments, by breeding *in-and-in* upon dogs, fowls, and pigeons: the dogs became, from strong spaniels, weak and diminutive lap-dogs, the fowls became long in the legs, small in the body, and bad breeders.

There are a great many sorts of fancy-pigeons; each variety has some particular property, which constitutes its supposed value, and which the amateurs increase as much as possible, both by breeding *in-and-in*, and by selection, until the particular property is made to predominate to such a degree, in some of the most refined sorts, that they cannot exist without the greatest care, and are incapable of rearing their young, without the assistance of other pigeons, kept for that purpose.

The Leicestershire breeders of sheep have inherited the principles, as well as the stock, of their leader, Mr. Bakewell: he very properly considered a propensity to get fat, as the first quality in an animal, destined to be the food of man: his successors have carried this principle too far; their stock are become small in size, and tender, produce but little wool, and are bad breeders.

By selecting animals for one property only, the same effect will, in some degree, be produced, as by breeding *in-and-in*: we shall obtain animals, with the desired property in great perfection, but so deficient, in other respects, as to be upon the whole an unprofitable stock.

We should, therefore, endeavour to obtain all the properties that are essential to the animals we breed. The Leicestershire sheep prove that too much may be sacrificed, even to that most desirable quality in grazing stock—a disposition to get fat at an early age, and with a small quantity of food.

Many causes combine to prevent animals, in a state of nature, from degenerating; they are perpetually intermixing, and therefore do not feel the bad effects of breeding *in-and-in*: the perfections of some correct the imperfections of the others, and they

go on without any material alteration, except what arises from the effects of food and climate.

The greatest number of females will, of course, fall to the share of the most vigorous males; and the strongest individuals of both sexes, by driving away the weakest, will enjoy the best food, and the most favourable situations, for themselves and for their offspring.

A severe winter, or a scarcity of food, by destroying the weak and the unhealthy, has all the good effects of the most skilful selection. In cold and barren countries no animals can live to the age of maturity, but those who have strong constitutions; the weak and the unhealthy do not live to propagate their infirmities, as is too often the case with our domestic animals. To this I attribute the peculiar hardiness of the horses, cattle, and sheep, bred in mountainous countries, more than to their having been inured to the severity of the climate; for our domestic animals do not become more hardy by being exposed, when young, to cold and hunger: animals so treated will not, when arrived at the age of maturity, endure so much hardship as those who have been better kept in their infant state.

If one male, and one female only, of a valuable breed, could be obtained, the offspring should be separated, and placed in situations as dissimilar as possible; for animals kept together are all subjected to the effects of the same climate, of the same food, and of the same mode of treatment, and consequently to the same diseases, particularly to such as are infectious, which must accelerate the bad effects of *breeding in-and-in*.

By establishing the breed in different places, and by selecting, with a view to obtain different properties in these several colonies, we may perhaps be enabled to continue the breed for some time, without the intermixture of other blood.

If the original male and female were of different families, by breeding from the mother and the son, and again from the male produce and the mother, and from the father and the daughter in the same way, two families sufficiently distinct might be obtained; for the son is only half of the father's blood, and the pro-

duce from the mother and the son will be six parts of the mother and two of the father.

Although I believe the occasional intermixture of different families to be necessary, I do not, by any means, approve of mixing two distinct breeds, with the view of uniting the valuable properties of both : this experiment has been frequently tried by others, as well as by myself, but has, I believe, never succeeded. The first cross frequently produces a tolerable animal, but it is a breed that cannot be continued.

If it were possible, by a cross between the new Leicester and Merino breeds of sheep, to produce an animal uniting the excellencies of both, that is, the carcase of the one with the fleece of the other, even such an animal so produced would be of little value to the breeder ; a race of the same description could not be perpetuated ; and no dependance could be placed upon the produce of such animals : they would be mongrels, some like the new Leicester, some like the Merino, and most of them with the faults of both.*

I have no doubt but that better stock may be obtained, in a few years, in this manner, from a large flock of well-chosen ewes, than by breeding, at first, from a small number of the pure Merino blood, (and many of them cannot be obtained ;) for the great advantage to be derived from the means of selection afforded by a more numerous flock, will more than compensate for the little stain of impure blood, which would be insensible in a flock, crossed in this manner, for four or five generations.

The introduction of Merino sheep to this country opens a fine field for improvement : it has been ascertained, that neither the sheep nor the wool sustain any injury from the change of climate or pasture ; and the absurd prejudice, that Merino wool could be grown only in Spain, is fortunately eradicated.

It is well known, that a particular formation generally indicates a disposition to get fat, in all sorts of animals : but this

* As this experiment has been made by myself and others in the United States, time will show the correctness of the above opinion—Editor.

rule is not universal, for we sometimes see animals of the most approved forms, who are *slow feeders*, and whose flesh is of a bad quality, which the graziers easily ascertain by the *touch*.—The disposition to get fat is more generally found in some breeds than in others. The Scotch Highland cattle are remarkable for being almost all *quick feeders*, although many of them are defective in shape. The Welsh cattle have but little disposition to fat; not from being particularly ill-shaped, but because they are almost invariably what the graziers call *bad handlers*.

I have always found the fineness of the fleece in exact proportion to the quantity of yolk it contained. Those who are unaccustomed to examine wool, may consider this as a certain criterion of its quality: for although the hair of some dry fleeces may be fine, it will always want the elasticity which is so much valued by the manufacturer.

It is to be regretted, that so little attention has been paid to the improvement of British wool, and particularly to that of the short-woolled breeds: a fine fleece is not only more profitable to the owner, but from the closeness of its texture, and the quantity of yolk it always contains, is a much better protection to the sheep in bad weather, than the open and hairy covering, which too generally disgrace our flocks. [I beg that the American farmer will attend to this hint—Editor.]

The fineness of the fleece, like every other property in animals of all kinds, may be improved by selection in breeding. The opinion, that good wool could only be produced in particular districts, is a prejudice which fortunately no longer exists.

Climate, food, and soil, have certainly some effect upon the quality of wool, but not so much as is generally supposed. The fleece is affected by the degree of nourishment which the animal receives, not by the quality of the pasture on which it is fed. If sheep are highly kept, the wool will be less fine,* but in other respects its flesh will not be deteriorated. The wool of a starved

* It is now established, that this remark does not apply to the Merino breed.—Editor.

sheep may be apparently fine, but it will be brittle, and of little value to the manufacturer.

A regular supply of food to the sheep is essential to the growth of good wool, for that part of the hair which grows when the animal is in a high state of flesh, will be thick, and that which is grown when it is reduced by hunger, will be weak and thin; and consequently the thickness of hair will always be irregular, if the animal passes from one extreme to the other.

The alteration which may be made in any breed of animals by selection, can hardly be conceived by those who have not paid some attention to this subject; they attribute every improvement to a cross, when it is merely the effect of judicious selection."

Upon the contested point of the size of cattle, it may be proper to say something on the present occasion.—Even keeping the grand object of all farmers and graziers, in view, viz. profit, the only consideration would seem to be, what variety of any particular breed of cattle will soonest make the most profit, or return of flesh or fleece from a given quantity of food. It follows therefore clearly, that if the same quantity of food be placed on one animal or on three, in a given time the profit to the farmer is the same. In the case of sheep, the superior value of the fleece may even more than compensate for a deficiency of flesh, were that an object of prime attention, but it is a fact, as has been more than once stated, that even in respect to flesh the Merino breed is inferior to none. Without detailing the arguments which might be urged on both sides of the question, we may say generally, that the result of several experiments made in direct reference to the point, was in favour of the superior profit of smaller animals.* Much more however will certainly depend upon the

* These experiments were made by the late Duke of Bedford, and the result inserted in the 23d and 26th Vols. of Young's annals of agriculture.—Those of Mr. Billingsley, and Mr. Davis, both well known as good farmers, are related in the 7th and 8th Vols. of the Memoirs of the Bath Society. See also Dr. Parry's prize essay on sheep, in "Communications to the Board of Agriculture of London," Vol. V. p. 461.

disposition of the animal to take on fat, than upon his size, and hence the great importance of attending to the improvement of form is made manifest. In the case of sheep, it will be seen by the communication* in this number, that those of a small size are more profitable feeders than the larger species. Both large and small cattle however are necessary; the former for long voyages, the latter for home consumption, and the judicious farmer will always of course suit his stock to his pasture, or to the particular situation or circumstances in which he may be placed. Thus on upland, if the farmer feeds on clover and has not the excellent green grass, or spear grass as it is sometimes called, (*Poa Viridis*,) it is a folly to attempt to feed cattle above 6 or 700 Cwt. for the frost will destroy his grass, and then corn, potatoes and hay must be resorted to. In the luxuriant meadows on Delaware and Schuylkill, owing to the abundance of that most excellent natural production of the United States, just mentioned, cattle will continue to thrive a full month after frost, and then, if destined for long voyages, corn meal for a short time will pay well; but as usually given, a loss will inevitably be sustained.

AMERICAN CATTLE.

NO slander against the United States has been more widely circulated than that first promulgated by the Count Buffon, that "all animals and vegetables are smaller in the new world than in the old." We owe the first refutation of this absurdity to Mr. Jefferson, who in his "Notes on Virginia," has by a fair comparison of the productions of both countries, shown, that so far from the fact being as stated by Buffon, the advantage is on our side.

The facts stated by Mr. Jefferson, were all derived from the production of our forests, and numerous others might be added of a similar nature. But with respect to the effect of cultivation on domestic animals, no collection of facts has as yet been made public, and for this reason the following paper is given. It will

* By Mr. Birkbeck.

show to the world, that our grasses contain as much nourishment, and that our climate is as favourable as that of the old world, to the rearing of stock. Great pains have been taken so insure accuracy in the details.

Account of large Cattle, Hogs, and Sheep, chiefly sold in the Philadelphia Market.

1. A Cow raised by the late Jacob Hiltzheimer of Philadelphia, and sold February 28th, 1787.

The fore quarters weighed	-	-	654 lbs.
hind do.	-	-	571
			<hr/> 1225
Hide weighed	-	-	111 lbs.
Head and heart,	-	-	49
Belly and feet,	-	-	72
Tallow,	-	-	<hr/> 163

2. A five year old Steer, fed by Lawrence Sickle, Esq. of Philadelphia, one summer and winter.

Beef,	-	-	1494½ lbs.
The belly fat,	-	-	278½
Kidney do.	-	-	100

3. Ten head of cattle fed by the same gentleman, produced 2,439 lbs. of belly and kidney fat, with one summer's feeding.

4. A Steer raised at Haddonfield, New Jersey, and killed at Philadelphia, April 1787, weighed alive, 2,140 lbs.

5. In June 1802, an ox was exhibited in New York; he was seven years old, and weighed upwards of 3000 lbs. net. He was twenty hands high, at the withers. His circumference around the ribs was ten feet, and the distance from the tip of his nose to the extremity of tail was 18 feet. He was raised in Beekmantown, Dutchess County, New York, by Theod. VanWyck.

6. An ox full as large as the above, was exhibited at Washington, in March 1804. He was six years old, and also weighed 3000 lbs. He was raised in Chester County, Pennsylvania.

7. An Ox fattened by James Hunt, of Hopewell, New Jersey, in 1807—weighed alive, - - - 2120 lbs.
 Weight of beef, - - - 1280
 Rough tallow, - - - 214
 Hide, - - - 121

8. A Heifer raised by Wm. West of Upper Darby, Delaware County, Pennsylvania, sold for 200 dollars to J. Barney.

Killed, March 1806.	Ft.	In.		
Length,	8	9	Live weight,	2135 lbs.
Height, - - -	5	7	Beef -	1303½
Girth, - - -	8	9	Rough tallow,	124½
Across the Hips,	2	9	Hide, -	124

A Steer, raised at Tulpehocken, Lancaster County, was killed on the 12th of March, 1807, weighed alive, 2,140 lbs.

9. A Steer raised by T. Smith, of Tinicum Island, Delaware Co. nearly 6 years old, killed March 26th, 1808, and sold for 250 dollars to John Barney.

	Ft.	In.	
Length, -	8	11	
Height, -	5	6	
Girth, -	8	11	
Across the hips,	2	8	
Live weight, - - -			2450 lbs.
Beef, - - -			1576
Tallow, - - -			203
Hide, - - -			130

10. Two Oxen fed by Joseph Taylor, of Brandywine, near West Chester, weighed alive, 4,368 lbs. Sold to J. Barney.

11. A Cow fed by L. Sickle, aged five years, killed April 7th 1808.

Weighted alive,	- - -	2226 lbs.
Weight of beef,	- - -	1994½
Rough tallow,	- - -	209½
Hide,	- - -	130

12. Weight of two Steers fed by William Sheaff.

Live weight,	- - -	2436—2432 lbs.
Beef,	- - -	1554—1543½

13. An Ox fed by Mr. Grub, West Chester, about 4 years since.

Live weight,	- - -	2128
Beef,	- - -	1312
Tallow,	- - -	192

14. A Steer 6 years old, from a Holland Cow, by an English Bull, raised from 4 weeks old, by Mr. Wm. Guier, of Philadelphia, killed March 9th, 1808.

Live weight,	- - -	2,387 lbs.
Four quarters,	- - -	1,540½
Hide,	- - -	117
Tallow,	- - -	173

Measurement.

	Feet.	Inches.
Girth, back of fore legs,	8	7
—, of neck,	8	11
Length from back of horn to point of rump,	8	8
Height over withers,	5	5
— over rump,	5	6½

Another Steer fed by Mr. Wm. Guier, weighed alive 2894 lbs.

Beef,	- - -	1829½
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15. Weights of a Milch Cow, raised by Jacob Hiltzheimer, fed by Mr. David Sickie, killed by G. Hopple, jun. March 30th 1799, 6 years old.

Fore quarters,	-	-	-	791 lbs.
Hind do.	-	-	-	595½
				<hr/> 1386½ lbs.
Tallow,	-	-	-	187
Hide,	-	-	-	166
				<hr/> 1,739

16. Dec. 1806.—Cow and Calf—grazed by D. Sickie. Cow 4 years old.—Calf 1 year and 10 months old.

Beef,	-	-	-	1002 lbs.
Calf,	-	-	-	778
Tallow of Cow,	-	-	-	177
do. of Calf,	-	-	-	84
Suet of Cow,	-	-	-	114
do. of Calf,	-	-	-	67

17. A Steer not four years old, and an Ox, grazed by W. Stanley, killed by G. Hopple.

Beef of Steer,	-	-	-	1402 lbs.
Tallow,	-	-	-	156
Beef of Ox,	-	-	-	1476
Tallow,	-	-	-	183

18. Ox raised by Mr. Mower, of Lancaster County, grazed and fed by Lawrence Sickie, Esq. killed by Tallman and Miller, April 5, 1810.

				Ft. In.
Girth behind the shoulders,	-	-	-	8 8½
— round the neck,	-	-	-	3 11
— round the loins,	-	-	-	9 0
— below the knee,	-	-	-	9½

	Ft.	In.
Height over the feet,	5	4
—— over the hips,	5	6
Width across the hips,	2	5
Length of carcass,	9	
Weight of forequarters,	952	$\frac{1}{2}$ lbs.
Hind do.	714	$\frac{1}{2}$
	<hr/>	
Tallow,	234	
Hide,	125	

The make of the above Ox, was uncommonly fine for so large an animal.

19. A Steer 6 years old, raised and fed by Samuel Tomkins, of New Jersey, and killed by Tallman and Miller, March 1810.

Beef,	1488	$\frac{1}{2}$ lbs.
Tallow,	326	
Suet,	140	

20. Two Steers 6 years old, raised and fed by E. Bissel, of East Windsor, Connecticut, and killed by D. Woelfper and Co. February 2d, 1811, of Philadelphia.

No. 1.

Fore quarters,	928	lbs.
Hind do.	647	$\frac{1}{2}$
Hide,	125	$\frac{1}{2}$
Tallow,	107	

No. 2.

Fore quarters,	919	lbs.
Hind do.	638	$\frac{1}{2}$
Hide,	125	
Tallow,	146	

21. A bullock 7 years old, raised in Morris County New Jersey, by Mr. Blanchard, and fed by Mr. M. Dubs, of Philadelphia.

Live weight,	-	2842 lbs.
2 Hind quarters,	-	815 $\frac{1}{2}$ lbs.
2 Fore quarters,	-	1201 $\frac{1}{2}$
		<hr/> 2017 $\frac{1}{2}$

Rough tallow,	-	188
Hide,	-	145

		Ft. In.
Height,	-	5 10*
Across the brisket clear of bone,	-	9
Through the plate and brisket,	-	10 $\frac{1}{2}$
Clear fat on the rib,	-	5 $\frac{1}{2}$
On the surloin,	-	4
On the rump,	-	3 $\frac{1}{2}$
On the back clear of bone,	-	3 $\frac{1}{2}$

Sold to J. Moore, and Wm. Warner, and slaughtered by them, March 20th, 1811.—Price 1000 dolls.

Hide sold for	-	\$10
Tongue,	-	5
Paunch,	-	3

22. In April 1809, was exhibited in Boston, an Ox, whose 4 quarters weighed,

	-	1758 lbs.
Hide,	-	128
Tallow,	-	247

Total, 2133

23. Thirty-six Hogs raised and killed by Francis Shinn of New Egypt, weighed,

	-	12,627 lbs.
The largest hog weighed	-	474
The smallest weighed,	-	297

The oldest hog did not exceed 18 months, and the youngest 10 months. The amount of the Pork was \$1,136 43.

* At the Cattle Show, April, 1810, he was 5 feet 7 and a half inches high.

24. A Hog 18 months old, raised by Mr. Ashbridge, in Chester County Pennsylvania, and killed March 1807, by A. and D. Lex, Philadelphia, weighed 654 lbs.

25. Several Hogs as large, and two larger, have been killed in Philadelphia, within the last four years.

ON THE COMPARATIVE PROFITS OF WILTSHIRE AND MERINO-CROSS SHEEP.

The following statement by a well known British farmer, will show the propriety of the Merino Cross, over a favourite species of sheep in England; and will also afford an example of the mode of conducting a feeding experiment with accuracy. The prices are in Sterling: the stone 8 lbs.—*Editor.*

To the Editor of the Agricultural Magazine, London.

SIR,

I BEG the favour of you to insert the following calculations and remarks respecting two pens of sheep, which I exhibited at Lord Somerville's Spring show in Goswell-street, on the 5th and 6th inst. viz.

FIVE WILTSHIRE WETHERS.

Live-weight Nov. 30, 1809	-	817 lb.			
March 2, 1810	-	999 lb.			
Increase in 13 weeks,	-	182 lb. at 8d. per lb.	£	s.	d.
Growth of wool in ditto,	-	-	6	1	4
			0	8	9
Increased value,	-	-	6	10	1

Food Consumed.

cwt.	qr.	lb.		£	s.	d.
Turnips, 43	1	6½	at per acre	£4. 10s.	1	2 6
Hay, 19	2	18	at	£5. per ton,	4	18 4
Oil-cake, 100			at 4d.	-	1	13 4
Cost of Food,	-	-	-	-	7	14 2
Loss at the above prices,	-	-	-	-	1	4 1

Five and three quarter Merino Wethers.

Live-weight, Nov. 30, 1809	537 lb.			
March 2, 1810	670 lb.			
Increase in 13 weeks,	133 lb. at 8d.	£	s.	d.
Growth of wool in do.		4	8	4
		1	5	0
Increased value.		5	13	4

Food Consumed.

	cwt.	qr.	lb.		£	s.	d.
Turnips,	21	1	20	nearly $\frac{1}{4}$ of an acre	0	11	0
Hay,	10	3	2	at £5.	2	13	10
Oil-cake,	100	0	0	at 4d.	1	13	4
Cost of Food,					4	18	2
Profit,					0	15	2

It appears from this experiment, that the food which was consumed by the large sheep, would have produced 14 per cent. more in absolute weight of mutton, if consumed by the small sheep; there is also a difference of more than 1d. per lb. in the value of the mutton, which is $12\frac{1}{4}$ per cent. besides 400 per cent. in wool.

N. B. These sheep were sold to Mr. King, of Newgate Market, March 5th, the large sheep at 5s. 8d. the small at 7s. per stone.

MORRIS BIRKBECK.

Wanborough, near Guilford, }
Surrey, March 6, 1810. }

ERRORS OF THE SUPPOSED

SPANISH SHEPHERD CORRECTED.

AMONG the numerous absurd publications on the subject of Merino Sheep, which have appeared in the public papers of the United States, the following stands conspicuous. From its having been given as the result of the experience of a Spanish shepherd, much weight is unfortunately attached to it, and I am sorry to learn, that the frightful picture it holds up, has had the effect of discouraging many of our farmers from attempting to introduce Merinos on their farms. To give high prices for a breed of sheep so subject to disease as the Merinos are here represented to be, and that require a degree of care, so much greater than nine out of ten of the American farmers have it in their power to bestow, would be reasons sufficiently strong to prevent the general introduction of that invaluable breed among us. But I hope to convince them of the little attention the paper merits. Indeed I doubt whether it is the production of a shepherd, for we know that the ignorance of that class of mankind is in the extreme, and that very few, if any, ever learn to read or write. I am induced to believe that the paper in question was written by a Spanish gentleman, in whose company I came in the Steam Boat from New York to New Brunswick, in October last; for another passenger who conversed with him, informed me, that he (the Spaniard,) had left a paper on the subject in Boston, with a friend who had requested it, and as only one paper of the kind has appeared, I think it highly probable, that the following remarks are those he alluded to. 'The Spanish gentleman was said to be a lawyer, and may have had a theoretical knowledge of the diseases of sheep; and even granting that what is said in his paper is true as applied to Spain, I aver that the alarming parts of it, apply but feebly to this country.—*Editor.*

From the Boston Chronicle.

Messrs. Editors—Having requested the Spanish Shepherd, whilst he staid in this town, to favour me in writing with all he knew and could recollect respecting the nature and management of the Merino sheep, with a view to render it public for the good of the country, I have received a really pastoral communication on the subject, which having translated literally, I presume you will, from patriotic motives, readily give it a place in your paper.

B.

Chelsea, 13th Oct. 1810.

Sir—Experience is very necessary and advantageous for the government and attendance of the Merino sheep, that have been brought into this country from the kingdom of Spain.

1st. The driest pastures and grass that can be found should be given them, guarding them from wet and damp places.

2d. When the weather is fair and clear, they should not be turned out until the dew is perfectly dry.

3d. They should be kept with great care from every standing or stagnant water, that has no current, and soap-suds are very pernicious.

4th. They should be carefully guarded from thunder and hail-storms; they should not graze then or drink of that water, waiting till the rain and hail moisture has disappeared, for this is very injurious to said sheep. The salt should be given them in the morning and in the evening, keeping them from drinking till three or four hours after; the salt in this country being different from that used in Spain, should be given sparingly till they are used to it; there it is of a red colour and from a pit, and here it is white, which is not so beneficial for the feeble sheep.

5th. This kind of sheep is very subject to have the scab, and it often makes its appearance from night to morning, and requires a constant attention to cure it—The best remedy is juniper oil; a decoction of black tobacco leaf is also good; but when the latter is used it is necessary that the weather should be dry, for if it should rain it would spread the more. The fourth part of a

pound of tobacco should be put in a kettle with ten or twelve pints of water, and after it shall have been boiled, the scab must be well rubbed with it in a luke-warm and not hot state, otherwise the wool would be injured.

6th. For the disorder called *basquilla*, (disease in sheep arising from a plenitude of blood) bleeding in the belly, on the fore part of the dug in a vein which they have there, is good.

7th. If any should swell in their belly, they should be bled under the corner of the left eye.

8th. For the disease of the spleen they should be pricked with an awl in the spleen, which is found by leaving three ribs behind and four fingers below the back bone. *This disorder of the spleen is very injurious; as for instance, if a sheep should die with it that wears a small bell, and this should afterwards be put on another, it will also die.* These their disorders proceed from too great an abundance of clear fresh grass; shepherds should be particularly attentive on this point.

9th. The small pox makes its first appearance by blisters or tumors on the flanks or hinder part of the sides, and then it spreads by degrees all over. It is necessary to separate the infected from the sound, so that they may neither lodge nor graze together; for one sick sheep is enough to infect all the rest. This disease proceeds from drinking standing water, and it is necessary to let it have its course, taking care to examine them often, and as soon as the pustules are broken, to anoint the same with sweet oil.

10th. In the disorder called *moderrez* (lethargy) they turn round as they are grazing. This arises from blisters that are forming in their brain, and they turn on that side where pustules grow. Very few recover from this disease, which is contagious. Some get well by pricking with an awl the affected part, and drawing the water, but they generally remain imperfect, and it is therefore better to kill those that have that disorder.

11th. Lameness—If it should be found that the foot is swollen and that it has matter, the points of the nails should be broken off until it bleeds; should it be perceived that its pera (a small

tuft of hair between the two nails, is swollen, it should be drawn out with a needle and cut around with a knife, pulling until it comes out: by this means it will heal much sooner than if it were burst.

12th. The horns of the rams are cut off in Spain for two reasons; the first is to avoid their striking one another with them in the season of generating; and the second is that it may serve them instead of bleeding in the spring, at which season it is executed, choosing fair and warm weather for this operation. This is the manner in which it is done:—A hole is made in the ground, the ram is put in it with his legs upwards, and a board on his head to which the horn is well fitted; then a knife made for that purpose is fixed against the horn level with the head, and is cut off with two blows struck with a hammer. This operation is performed every year with only those that are preserved for propagation, and are distinguished by the name of *Moruecos* (ram, or male sheep.)

13th. It is customary in Spain, to allow two ewes to one lamb, that they may soon get strong and be able to resist the inclemency of the weather, and it should be studied that they come into the world in a fine season; they ought to have a dry litter, and when they are turned out to graze, it should be in a sunny place free from any water. The disorders to which the lambs are liable, are the following:—The *Lobanillo* (wen, ganglion) in which their kidneys swell. The *Amarilla* (jaundice) in which their flesh and bones turn of the colour of yellow wax; this disorder is infectious; throwing a small quantity of *Torvisco* (flaxleaved daphne, (*daphne gnidum*) is good for this complaint. The *Covino* (curb) they are lame in their feet; if these should swell, it is good to anoint them with juniper or sweet oil.—All these disorders proceed from damp and wet weather when they are brought forth; and are besides subject to all the complaints of the ewes, for which the same remedies before-stated must be observed.

14th. The tails of these sheep are cut off because it is the custom, and because if they should have the disorder called *Chamberga* (diarrhoea) the dirt they would collect in the wool of the

tail would be considerable, and would certainly spoil the remainder with it.—This operation is performed when they are two months old, with a very sharp knife, cutting away the wool around it with a pair of scissars to prevent its sticking to the wound, choosing for this purpose warm and fine weather.

It is very necessary and advantageous to observe attentively all things before stated, if one wishes to avoid considerable loss in this kind of sheep.

God preserve you many years.

(Signed)

PHILIP DE CASTRO.

A native of the mountains of Leon, in Spain.

REMARKS.

THE first caution, respecting the necessity of dry pastures is known to all farmers, as applicable to *every species* of sheep.

The second caution, respecting the propriety of not turning out the sheep, before the dew is exhaled, does not apply in the United States, nor in England: In neither of which has it been found in the least injurious. I can myself speak positively and experimentally on the subject. Mr. Livingston,* has clearly shown, that the prejudice concerning the dews, originated in the wishes of the shepherds, to abridge as much as possible, the trouble of attendance on their flocks: for their laziness is proverbial, so that while the poor animals were starving in the fold, they themselves might indulge in sleep.

Third, water whether current or stagnant, is alike injurious, if sheep be much exposed to it. The caution about soap suds was useless, for they can never be exposed to the danger of standing in them, nor can I see why suds should prove injurious.—Would they not cleanse their feet? I have myself often used soap to wash the clefts of their hoofs, when affected by soreness, previously to the application of a remedy to cure it.

* His work (of which a second edition has been published), should be in the hands of every farmer.

My sheep were never sheltered, on account of thunder storms, and they did not suffer. Hail storms occur but seldom in Pennsylvania; it would certainly be well to put sheep under cover in a hail storm, for their eyes might be put out, and the lambs killed, if the stones were large; but to suppose that the hail-moisture or rain that falls in a thunder-storm are specifically injurious, is like the prejudice about *dew*, absurd. I never used any salt for my sheep except white salt, and this was given them when convenient, generally once a week throughout the year, some times in the field, and at other times in the sheep house. The red salt mentioned, is as hard as a stone, and derives its hue from iron; and there is no reason for supposing that it possesses superior medicinal qualities.

Fifth. I deny positively, that Merinos are particularly liable to the scab, when properly treated. I have never had the scab in my flock. The Merinos imported into the United States during the past year have been much afflicted by it, owing to the great fatigue they underwent before they were shipped, and to want of cleanliness, of ventilation, and to the scanty food while on ship-board. Juniper oil is not better than spirits of turpentine, or tobacco water, for the scab, or other remedies, and is far more expensive.

Sixth. Blood taken from any part of the body will answer as well as from the dug vein. Pasture less rich should be afterwards chosen.

Seventh. The last remark will apply here; a wine glass full of castor oil should be given when the body swells.

Eighth. I do not know the symptoms of diseased spleen in sheep, and do not find it mentioned in any of the many treatises on sheep which we have. The notion of this affection being propagated by a sheep wearing the bell of one that died of it, is about as reasonable as the story gravely told by an old medical writer in Germany, of a dog catching the gout from sleeping at the feet of his gouty master!!!

Ninth. It is a fact that Merinos recently imported into this country, have had a disease very much resembling the small pox;

but we know nothing of it among those that arrived here before, or that descended from them. When it appears however, it must be attended to, or it will kill. The directions to separate the diseased from the healthy, are judicious : but the sick sheep should also be purged, and the pustules opened by a lancet, and cleanliness observed.—If the disease appear partially, the wool should be plucked out from the part.

Eleventh. A careful farmer will never permit a disease in the foot to proceed to such a height : if matter is formed, let it be opened by a lancet : do not touch the nails unless they require paring, and then use a knife.

I repeat—Merino sheep when well treated, are a healthy race.

FACTS concerning the SLABBERING DISTEMPER in HORSES, and other DOMESTIC ANIMALS : In a letter from THOMAS MOORE, of Montgomery County, (Maryland), Farmer to Dr. MITCHELL, dated Brookville, 22d Feb. 1805.*


AGREEABLY to thy request, I shall endeavour to give a concise history of the slaving disease of horses, kine, sheep and hogs, which has, for some time, existed in this country, conformably to the facts which have come under my observation.

Late in the summer of 1795, I was told that the grass from a certain lot in the neighbourhood produced a remarkable defluxion of saliva from the mouths of horses. Soon after harvest, in the year 1796, I discovered something of it on my own farm, and was told that it had appeared on several others. In the course of a year or two more, it became general throughout the neighbourhood, gradually increasing in its effects, and beginning earlier in the season every succeeding year, until about the year 1802, since when it appears to be nearly stationary. It now commences about the last of the fifth month, and continues through the summer and autumn. It was not discovered for some years that any other animals than horses were affected by it, nor was their health supposed to be materially injured ; but at length,

* Medical Repository, Hexade 2, Vol. 3, p. 24.

Mare, sheep, and hogs began to be sensibly affected, and it was found that horses would *actually die* if confined to the grass of certain fields without any other food.

The calamity now assuming a serious aspect, my attention (as well as many others) was turned towards a discovery of the *cause*, in hopes of being thereby enabled to take such measures as would lessen the *effects*. Red clover being the grass most commonly used for green food on many farms, an opinion very early prevailed, that the introduction of *this grass* had produced the disease. To this opinion, however, I could not subscribe, having frequently observed that the disease was produced in as great a degree by the grass of some fields where there was not a plant of clover to be seen as by any other; and, on the contrary, I found, by inquiry, that the disease was then unknown in several parts of Pennsylvania where red clover had been much longer in use than with us. But from observing that a small hard-stemmed grass generally made its appearance about the time the disease began, I (with many others) was led to believe that this grass was the cause; and, in order to ascertain it, made the following experiments: I picked over about seven pounds of red clover so carefully that I knew there was not a blade of any other kind of grass amongst it, and gave it to an hungry mare, entirely free from disease. In one hour after eating it, I was surprised and disappointed, by finding the disease to be excited in a considerable degree. The mare was then kept on dry food until she was again freed from disease, and an experiment made on the small grass before spoken of, the result of which was the same. Similar experiments were afterwards made on several other kinds of upland grass, and always with the same result. We also find, that any kind of grass which will produce the disease in its green state, will produce nearly the same effects when dry. In the course of the last two years it has become general throughout a district of country of some hundred miles in extent: and although I have yet heard of but few places where other animals than horses are materially affected by it, yet, from the increasing effect on them, and the rapid spread of the disease, it is to be apprehended, that



the time is fast approaching when it may be considered among the most serious calamities with which this country has been visited.

The symptoms in horses are a constant discharge of a watery fluid from the mouth, (probably to the amount of several gallons in twenty-four hours) without any apparent inflammation of the salivary glands ; great thirst, dulness, loss of flesh, always exhibiting the same sunken appearance in the flank as an animal that is almost famishing for food : after some continuance of these symptoms, comes on a stiffness in all the limbs, which altogether continue till death. In other animals the symptoms appear to be nearly similar, though less in degree. Milch cows suffer a considerable diminution in the quantity of their milk, and still greater in quality, so that the profits of the dairy are much lessened. Dry cattle require a much longer time to fatten ; and indeed, on some grounds, can scarcely be fattened at all. Hogs are not perceivably benefited by any grass which produces the disease in considerable degree. Sheep do not suffer as great inconvenience from it as any of the three last mentioned animals, yet they are sometimes very sensibly affected.

From some late observations I am inclined to believe, that if hay be put in bulk in such an uncured state as to cause it to pass through a very strong heat, the pernicious effect will be nearly destroyed ; and if on further trial this proves to be the fact, may it not, in conjunction with the two following, to wit, that the disease is confined to uplands, and that ploughing generally eradicates it for at least a year (being always worst on grounds which have lain long in grass), afford something like a clue to unravel the mystery ? Low grounds being, as far as we know, entirely exempt, looks like the exercise of animal instinct in regard to situation : and the effect of the plough to remove the cause for a short time, and the same afterwards gradually increasing, favours the supposition of the existence of an *insect* which may in some way produce the disease : perhaps by either an *excrementitious* or *ovarious* deposition on the grass, the qualities of which (particularly if ovarious) would probably be much chang-

ed by the degree of heat before mentioned. But I do not believe that any such deposition has *yet* been discovered.

I remember, in one instance, to have observed a reddish appearance produced where the clover from a horse's mouth was dropped on purple cloth ; hence may be inferred the presence of an acid of some kind.

In the foregoing statement I have related the facts nearly as they came under my own observation, with respect to the order of time ; but, on conversing with some old observing men, I find the disease is not *entirely new*, but that the second cutting of grass, in several places, has for many years been known to produce the disease in a very slight degree ; yet so inconsiderable as not to excite serious attention.

These are the principal facts which have come to my knowledge relative to this extraordinary disease ; and these, I hope, will be sufficient to *insure the subject a scientific investigation* ; for surely that man will deserve well of his country, who, *by developing the cause*, will aid us in our endeavours to overcome the calamitous effects.

THE salivation, in animals, particularly in horses, from eating second crop grass, especially red clover, is an effect well known and lamented in the state of Pennsylvania, and in some other states : whether in all is uncertain. I have been at some pains to ascertain the epoch of its appearance, but I am sorry to say, that my inquiries have been attended with little success.— Thus much is certain, that it appeared in different parts of Pennsylvania, at various times ; hence while some farmers have mentioned 15 years, others have said that it did not appear on their farms until 10—8—5 years past.

In the county of Montgomery, state of Maryland, it was noticed by Thomas Moore, as stated in his paper, for the first time in 1795. Others had remarked it before. A gentleman informed me, that he well remembered to have seen it in 1779, in horses pasturing on State Island, below Philadelphia. Mr.

Samuel Preston of Stockport, Wayne county, Pennsylvania, first observed it about six years ago.*—At first it was ascribed to the Gypsum, which was strewed early in the spring on the clover; but this theory cannot be correct, because second crops of other kinds of grass will salivate equally with clover, although they never were plastered. This I have had full opportunity of knowing, and the fact is agreeable to the observations of several others whom I have questioned as to the point. Timothy grass will have the effect, but not to the extent of clover; even green grass in some years is not free from the bad quality. It was also supposed to be confined to second crop red clover, but the fact just mentioned, with that stated by Thomas Moore, viz. that the disease was unknown in certain parts of Pennsylvania, where red clover had been much longer in use than in his neighbourhood, fully refute this opinion. On the other hand, Mr. Preston says, he has observed the disease to travel with the cultivation of clover, but this only proves that the disease is in some way connected with the cultivation of that plant. Mr. Preston remarks, that white frost puts a stop to the complaint, and hence he concludes that frost kills some plant which he supposes is the cause of the disease. It prevails in some seasons with much more violence than in others: last summer was remarkably cold and wet, and his horses had the disorder worse than ever: it not only reduced their flesh, strength and spirits, but rendered them incapable of service; they were therefore stabled and fed on dry hay. One young horse was neglected by not being put up, and died from the effects of the salivation. In a former letter however, he remarks, that "he knows of no change in the quality of his pasture during the time the disease continued," neither, says he, "do I know how to impute it altogether to the wet seasons, as we have had more or less of it for several seasons." This fact is conformable to my own experience, and that of others whom I have consulted.

In a communication on this subject by Dr. Perlee, of Wilming-

* Letter to the Author.

ton, Delaware, to the Agricultural Society of Philadelphia,* the disease is ascribed to the spotted spurge, the *Euphorbia maculata* of Linnaeus, which grows with the clover, and flowers, about the same time as the second crop of clover.

He gave a horse a small quantity of spurge carefully gathered stem by stem, and perfectly free from all other vegetables, or any extraneous matter. A preternatural discharge of saliva took place in less than half an hour. This experiment was frequently repeated, and invariably with the same result. To prove that clover did not contribute towards it, in some cases, other grass was used as an envelope with the same effect. And when the horse was perfectly free from ptyalism, a considerable quantity of clover, gathered without *Euphorbia*, was given to him, and no such effect was produced. But this does not prove that the spurge is alone in fault, for Thomas Moore found that clover carefully picked produced the same effect: and a botanical friend who knows *Euphorbia* well, assures me he examined a field belonging to himself with great accuracy, without finding a plant of that genus in it, and yet a horse in the field, was slabbering profusely.

On a recent discussion of the subject at the Agricultural Society, a member mentioned, that a labourer, who in stacking a second crop of clover, had his arms, which were bare, covered with very small insects from the hay, said that they were the cause of the salivation in horses. He ascribed the effect to the acidity of the insect. Thomas Moore's fact of the change produced on a purple cloth by the saliva of a horse, supports the opinion.

There is certainly something very disagreeable to cattle in second crop clover hay. They do not relish it, and even in some cases refuse it. Mr. John Lorain of Philadelphia county, bought some cattle in the autumn of 1809, and found that after his corn stalks and stubble hay had been consumed, they in general refused second crop clover, although it had been well got in, and salted: a few eat it sparingly, and after some time they fell away in flesh, and in 21 days, during which time he tried to induce them

* See Memoirs Agricultural Society, Philad. Vol. 2.

to eat the clover, they began to scour, and were worth £200 less than when they began on it. He then mixed equal parts of green grass hay (*Poa Viridis*) and second crop clover, and found that they eat it more readily, but that they still did not relish the mixture. Mr. Lorain had previously given to the cattle corn fodder, but discovered that it was strongly disliked at first even by those which had eaten it readily the year before, as well as by the new cattle,* and that they preferred the old thatch on the sheds, and dry leaves in the barn yard, until they had been fed on about one acre of fodder, from corn planted in July for boiling or roasting ears; which being very succulent was eaten greedily, and after it was all consumed, they showed no dislike to the other.

Method of preventing the Accidents which frequently happen from the Linch Pins of Carriages breaking or coming out, by Mr. J. Varty, coach-maker, Liverpool. From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce. The Silver Medal was voted to Mr. Varty for this Invention.

HEREWITH the Society will receive a model of an axle-tree for public machines, intended to prevent the wheel from coming off if the linch-pin should break, and thereby prevent many dangerous consequences. When the idea first suggested itself to me, I put it in practice in a stage-coach, which has since run from Liverpool to Litchfield, a distance of eighty-four miles, six days *per* week, for the last six months. During that time several instances have occurred in which the linch-pins have broke or come out, but owing to this contrivance no accident has happened therefrom. We almost daily hear of stage-coaches being upset, which more frequently arises from linch-pins breaking than from any other cause.

* This fact cannot be accounted for: as it is well known, that cattle are commonly very fond of corn fodder—Editor.

Certificates were received from Liverpool from several persons, who declared that they have witnessed many very melancholy accidents happening to passengers in stage-coaches, in consequence of the linch-pin breaking made in the common way, and from which some of them have been sufferers; but that they have never seen or heard of any such accidents where Mr. Varty's invention was made use of, though several of his linch-pins have broke.

FIGURE 1.

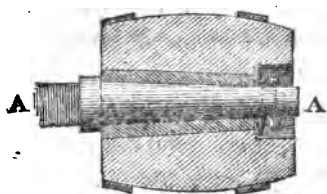
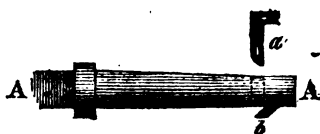


FIGURE 2.



REFERENCES.

Fig. 1, is a section of the nave of a carriage wheel, with the axletree AA in it; and Fig. 2, is a separate view of the axletree. *a*, Fig. 2, is the linch-pin detached; it is put through an oblong hole in the axle as usual, but there is likewise an additional linch-pin *b*, to make it complete, which is fixed in a recess cut for it in the axle, and turns on a pin (as is shown in the figure) into the hole left, by removing the linch-pin *a*, when the wheel is to be taken off; but if the linch-pin *a* should accidentally get out, this additional pin *b* would effectually keep the wheel on, as its hanging position does not at all tend to shut the pin up into the axle, but the contrary. The common linch-pin *a* is put in downwards, that its weight may always tend to keep it in, and is secured in the usual way by a strap, the holes for which may be seen in the figures.

ON MANUFACTURING PYROLIGNEOUS ACID.

Acetate of Iron—or Iron Liquor, and Acetate of Alumine.

THE extensive use of these preparations by Dyers, and Calico printers, renders the knowledge of the mode of making Pyroligneous acid, of great importance ; for this reason the following information is given. It is collected from various sources, but chiefly from the *Commercial Magazine of London*.

THE name Pyroligneous has been given, because it was distilled from wood ; it had been long known that the hardest woods afforded an acid principle mixed with an oil, which partly disguised its properties. But no one had directly attended to a determination of the habitudes of this acid, until Mr. Goetting published his researches on the acid of wood, and the ether it affords. The following is the most common method practised to obtain it.

Having a large cast iron cylinder, one end of which can be opened to admit wood, and formed to shut so as to exclude the air. The cylinder is placed in such a manner, that the fire is under it to heat it as much as possible. Oak, in pieces about a foot in length, is put into the cylinder, which is filled as full as possible, without being wedged, and the door shut close to exclude air ; from the cylinder is a worm that runs through cold water to condense the acid, by this it is conveyed to a large cask placed on one end, where there is a pipe to carry the acid from that to two or three more ; thus the acid is completely secured from flying off in the vaporous state ; the fire is raised to a great heat, sufficiently powerful to convert the wood completely into charcoal (coke.) When the acid is done coming over, the fire is taken out, and the mass is left to cool in the confined state, when it becomes perfect charcoal. In the first cask tar is chiefly contained with the acid, it precipitates to the bottom, and is drawn off by a cock ; it is afterwards boiled in an iron boiler to evaporate the acid before it is fit for use ; if the acid is not strong enough, it is put into large square vats about

six inches deep, for the purpose of making a large surface, to evaporate a part of the water contained in the acid more speedily by a slow heat. These vats are bedded on sand upon the top of a brick stove, where a gentle heat is applied; thus it may be got in a pretty strong state. This acid is used instead of acetate of lead (sugar of lead) by the calico printers, to make their acetate of iron or iron liquor; though it is not sufficiently pure, it does well enough for blacks, browns, drabs, &c. but for yellows or reds it is not so good, owing to the oil and tar which are in combination with it. However, some have attempted to depurate (purify it) and have in part succeeded, and I have no doubt but in time it will answer *all* the purposes of acetate of lead. It tastes of acetous acid mixed with oil, and smells a little of tar, in the same manner as the smoke of wood when burning does. In fact, it is merely acetous acid holding an empyreumatic oil in solution. In order to obtain this acid, Mr. De Morveau distilled small pieces of very dry beech wood in an iron retort, by a reverberatory furnace; he changed the receiver when the oil began to rise, and rectified the product by a second distillation. Fifty ounces of very dry chips, afforded 17oz. of rectified acid of an amber colour, not at all empyreumatic, whose specific gravity compared with that of distilled water, was 49 to 48.

To cleanse the Pyroligneous acid, the following plan has been proposed.

“I would propose that the filter should be made of wood, of a pyramidal form, well seasoned, and well put together. The inside should be stuck full of small wooden pegs, and then overlaid with a coating of calcined gypsum and sand, of about an inch thick; or of fresh burnt quarry lime and sand, brought to the proper consistence with water, and immediately after covered with pounded glass, of the fineness of sea sand, by sifting it through a wire sieve.—Sand may answer the purpose well enough; but if it cannot be got, broken green glass will furnish an adequate substitute. The pegs are intended to secure the adherence of the lining, which should completely cover them. In this manner an artificial stone or glass funnel of any requisite size may be easily supplied,

through which the liquor may be strained without the hazard of receiving, or of being injured by any foreign metallic impregnation, to guard against which more effectually, the joinings should be all dove-tailed, and wooden pegs used instead of nails, wherever these are necessary. Let the bottom opening be closed with a piece of strong hair cloth, or coarse canvas to support a layer of flint, broken into pieces of the size of a walnut ; this to be followed with two or three more layers of the same material, or of green grass, progressively smaller in size ; the surface being made level, and the interstices filled up with a layer about the size of hemp-seed, sifted over it through a tin riddle. Cover this with fresh burnt charcoal, (the residum of the article from which the acid is distilled), to the thickness of three or four inches, which should not be smaller than peas, and this may be again covered with a layer of an inch thick as fine as sand, which may be occasionally removed as it becomes clogged with the impurities of the liquor filtering through it. It is obvious that the charcoal must be secured from floating, by a covering of sufficient weight of broken or flint glass.

A cask, or large box, having its bottom bored full of holes, may be used instead of this trough funnel, being lined in the same manner."

Iron liquor, or acetate of iron, was formerly made of vinegar and old iron ; at present it is formed by the pyroligneous acid and copperas. To obtain this, as much chalk is thrown into the above mixture, as will destroy the acidity. The rationale is as follows :

The chalk saturates the pyroligneous acid ; the sulphuric acid then unites with the lime, while the pyroligneous acid in consequence of double affinity, combines with the iron, forming the iron liquor, which remains in solution, and is taken for use.

In preparing acetate of alumine, acetate of lead and alum are employed, and the same process pursued as for iron liquor.

FERTILITY OF AMERICAN GENIUS.

By a report made to the House of Representatives, by the Secretary of state, in January last, it appears, that from the passage of the law for the protection of the rights of inventors, discoverers and authors, to the 1st of May 1805, five hundred and ninety-six patents had been issued. From that date to the 28th December 1810, eight hundred and two patents were taken out. The Editor intends to make an arrangement, in order to enable him to publish in the ensuing numbers of this work, a regular statement of the patents which have been granted during the preceding quarter, and he offers the "Archives" to the ingenious, as a proper channel to announce and describe their inventions and discoveries.

The following publication of Mr. Thornton, will prove highly serviceable to those persons who intend to apply for patents from the general government.

(From the National Intelligencer.)

TO THE CITIZENS OF THE U. STATES.

Patent Office, March 5th, 1811.

HAVING the honour of directing or superintending the important duties of issuing patents for arts and inventions, which formerly were thought worthy of the labours of a council, composed of the secretary of state, the secretary of war, and the attorney general of the United States, I have thought it a duty to my fellow citizens to publish a few lines of information to facilitate the mode of acquiring patents, by which many will be enabled to dispense with long journies to the seat of government, or with troubling their friends by a tedious correspondence.

Before an application be made for a patent I would advise the inventor to examine well the dictionaries of the arts, and sciences, the Repertory of Arts and other publications that treat of the mechanic arts, to endeavour to ascertain if the invention be new; also to make inquiry of scientific characters whether or not the invention or discovery be practicable. These previous inquiries will sometimes prevent great trouble, and save the expense of much time, labour, and money; for a patent does not

confer rights, where just claims do not exist; and as there is at present no discretionary power to refuse a patent, even where no just claim exists, it may be proper to caution the purchaser of patent rights against the supposition that the invention patented is always valuable, or new, or that it interferes with no previous patent. The respectable names of the president, the secretary of state, and attorney general are requisite to give validity to a patent; but ought never to be considered in any degree as evidence of the originality or utility of invention. The issuing of patents is grounded not only on a desire to promote the progress of useful arts, but also to prevent the loss of valuable secrets; for many have been buried with the inventors previous to the organization of this system of protection for the property of talent, mind, and genius. Formerly the arcana of any profession were withheld from the tyro; his initiation was gradual and secret, and the caution with which inventors worked to prevent the infringement of unprotected rights, confined many important inventions to limits too narrow to materially benefit either the inventors or the world: at present the law grants a monopoly to the inventor, for a limited time, provided the art, invention, discovery or machine, be duly explained, deposited, and recorded, for the benefit of mankind as soon as the time limited has expired—and the patent is not only an evidence that the inventor has formally confided his secret to the public, but some declaration of the protection of the right from infringement; nevertheless, of the right, by others, a jury of the country is only competent to decide.

The general law concerning the issuing of patents will be found in the 2d vol. of the Laws of the United States, page 200. This law provides for citizens only; but a subsequent law, vol. 5th, page 88, provides also for applicants who have resided two years or upwards in the United States, and who are not citizens.

In applying for a patent it is necessary to attend to every legal form, for in consequence of inattention to* forms only, some of the patents issuing formerly, have in the course of law been declared null and void.

* Oliver Evan's, among the number.

MODE OF APPLICATION

* "Every inventor before he presents his petition to the secretary of state, signifying his desire of obtaining a patent, shall pay into the treasury of the United States, † thirty dollars, for which he will be furnished with duplicate receipts ; one of which he shall deliver to the secretary of state when he presents his petition : and the money thus paid, shall be in full, for the sundry services, to be performed in the office of the secretary of state, consequent to such petition. This petition must be addressed to the secretary of state, and may be in the following or in a similar style,

TO THE HON. ROBERT SMITH, ‡ SECRETARY OF STATE OF THE UNITED STATES.

The petition of A. B.—of———in the county of———and state of———respectfully represents— That your petitioner has invented a new and useful improvement " [¶ or art, machine, manufacture or composition of matter, or any new and useful improvement in any art, machine, manufacture, or composition of matter] in———not known or used before his application," the advantages of which he is desirous of securing to himself and his legal representatives : he therefore prays that letters patent of the United States may be issued, granting unto your petitioner his heirs, administrators or assigns, the full and exclusive right of making, constructing, using, and vending to others to be used, his said improvement, [art, invention, machine, manufacture or composition of matter, &c.] agreeably to the acts of congress in such case made and provided ; your petitioner having paid thirty dollars into the treasury of the United States, and complied with the other provisions of the said acts.

A. B.

[Date.]

* See laws of the United States; vol. 2d, chap. XII. § 11, p. 205.

† Notes on any of the banks of the United States.

‡ James Munroe is now secretary of state—Editor.

¶ 1st § of the above, p. 200.

The *specification* or description of the machine, art, discovery or invention, must be given in clear and specific terms, designating it from all other inventions, and describing the whole in such a manner as to comprehend not only the form and construction, (if a machine) but also the mode of using the same; and if it be only an improvement on a certain machine already invented by the applicant, or any other, it ought to be so mentioned or described: and as this specification, description, or schedule enters into and forms part of the patent, it must be without any references to a model or drawing, and must be signed by the applicant or applicants before two witnesses. It is material that this be in good language, and correctly written, as it is transcribed into the patent, and the original papers will be deposited in an office that will hand them down to posterity, by which the honour of the country is concerned in this attention. The modest inventor will no doubt exclude those panegyrics on the excellence of his invention or discovery, which abound sometimes in the productions of the inferior genius, but which ought not to enter into the patent.

The following or a similar oath or affirmation taken, (before a judge of any of the courts, or a justice of the peace, or any person qualified to administer an oath) by the applicant or applicants, must be subjoined to the specification, if citizens of the United States.

FORM.

County of _____ }
 State of _____ } ss.

On this _____ of _____ 181 _____ before the subscriber, a justice of the peace, in and for the county aforesaid, personally appeared ~~before~~ the above named A. B. and made solemn oath (or affirmation) according to law that he verily believes himself to be the true and original inventor or discoverer of the art [machine, invention or improvement, composition of matter, &c.] above specified and described for _____ (mention here the object or intention) _____ and that he is a citizen of the United States.

J. P.

If not a citizen (or, citizens) the following addition must be made to the declaration, that he verily believes himself to be the true and original inventor or discoverer of the art, &c.

* And that the same hath not, to the best of their knowledge or belief been known or used either in this or any foreign country.——” Also that he (or she) hath resided in the United States two years and upwards. J. P.

The specification must be accompanied by a good drawing, in perspective, of the whole machine or apparatus—“† where the nature of the case admits of drawings; or with specimens of the ingredients, and of the composition of matter, sufficient in quantity, for the purpose of experiment, where the invention is of a composition of matter.” “And such inventor shall, moreover, deliver a model of his machine, provided the secretary shall deem such model to be necessary.” It is requisite, in giving a drawing of the machine, to give also rational drawings of the interior, when the machine is complex; and every drawing should be accompanied by explanatory references. When a machine is complex, a model will likewise be necessary, not only to explain and render it comprehensible to a common capacity, but also to prevent infringements of rights; for many will plead ignorance of drawings, who cannot avoid the conviction of wheels and pinions.

The drawings ought not to exceed a quarto size, and if confined to octavo they would be still better, where it can be done conveniently and distinctly.

Many of the drawings in this office are executed in a very handsome style, and do much credit to the talents of the gentlemen whose names are ascertained. If the artists would always sign them, information might be given to the applicants for patents where to apply for drawings.

* Laws of the United States, Vol. v. ch. xxv. p. 89.

† Ibid. Vol. ii. ch. xii. p. 202.

Among the best I have received, I notice the names of
Messrs. JAMES AKIN, *Philadelphia*.

JACOB CIST, *P. M. Wilkesbarre, Penn.*

FRANCIS GUY, *Baltimore*.

GEORGE HADFIELD.

NICHOLAS KING, *City of Washington*.

———— PECKMAN, *Roxbury, Massa.*

JOHN R. PENNIMAN, *Boston*.

ARCHIBALD ROBERTSON, *78 Liberty st. N. Y.*

———— STEWART, *Hartford, Con.*

JOHN STICKNEY, *Baltimore*.

———— STILES, *Worcester, Mas.*

WILLIAM STICKFORD, *Philadelphia*.

JAMES WATSON, *Utica, Oneida Co. New York*.

Many being without the names of artists, I cannot do all the justice I wish.

The papers must all be sent under cover to the secretary of state, which of course renders them free of postage: but if models be sent, their freight or carriage hither must be paid; and before packing them, the name or names of the inventor or inventors should be written thereon, with the name of the machine, and the date:—for sometimes on receiving them it is difficult to know to whom they appertain.

The congress, being impressed with a high sense of the value of the inventions of our citizens, have purchased an elegant and extensive building, wherein preparations are now making for the accommodation of a very numerous collection of machines illustrative of the ingenuity displayed; and this museum of the arts it is presumed, will stimulate the ingenious to send the models of their machines and inventions in a style that will rather honour than discredit the country.

Copy-rights of books, prints, charts, maps, &c. are secured by* depositing before publication, a printed copy of the title of such

* See an act for the encouragement of learning, &c.—laws of the United States, Vol. 1. ch. xv, § 3. p. 121.

map, chart, book, or books, in the clerk's office of the district court, where the author or proprietor shall reside, who will record the same; and the author or proprietor shall within two months from the date of the record, cause a copy of the said record, to be published in one or more of the news-papers printed in the United States, for the space of four weeks. *And within six months after publishing the map, chart, book, or books, the author or proprietor shall deliver or cause to be delivered to the secretary of state, a copy of the same; and when deposited and entered into the patent office, a certificate will be returned of its being received.† This will secure the sole right of publication for fourteen years to the author or proprietor, if a citizen of the United States, or resident—"and if at the expiration of the said term, the author or authors, or proprietors, any of them be living, and a citizen or citizens of these United States, or resident therein, the same exclusive right shall be continued to him or them, his or their executors, administrators or assigns for the further term of fourteen years: *Provided* he or they shall cause the title thereof to be a second time recorded, and published in the above manner, within six months before the term of fourteen years aforesaid.

WILLIAM THORNTON.

* Ibid. Sect. 4. p. 122.

† Ibid. Sect. 1. p. 118, 119.

ERRATA.

Page 64, line 17; erase "*crooked and.*"

68, 5, "for produce," read *produces*.

78, 3d line from bottom, after "powder," add *for every 20 head.*

88, 13, for "as far back as the tail," read *the back as far as the tail.*

91, 6, for 155, read 145.

93, *note*, for *was* read *were*.

109, line 2, in some copies, for "which was," read, *which were.*

115, 3d line from bottom, for "less," read *shorter.*

123, line 21, for "that," read *from.*

219, 6 lines from bottom, erase, "sir,"

last line, for *Deliches Soyæ*, read *Dolichos Soja.*

241, *note*, for "12000," read 1200.

280, 11th line from bottom, after "cover," add, *leaving.*

317, the last line of p. 317, and the two first paragraphs of p. 318, belong to the bottom of p. 308.

337, line 22, for "pened," read *opened.*

• • •

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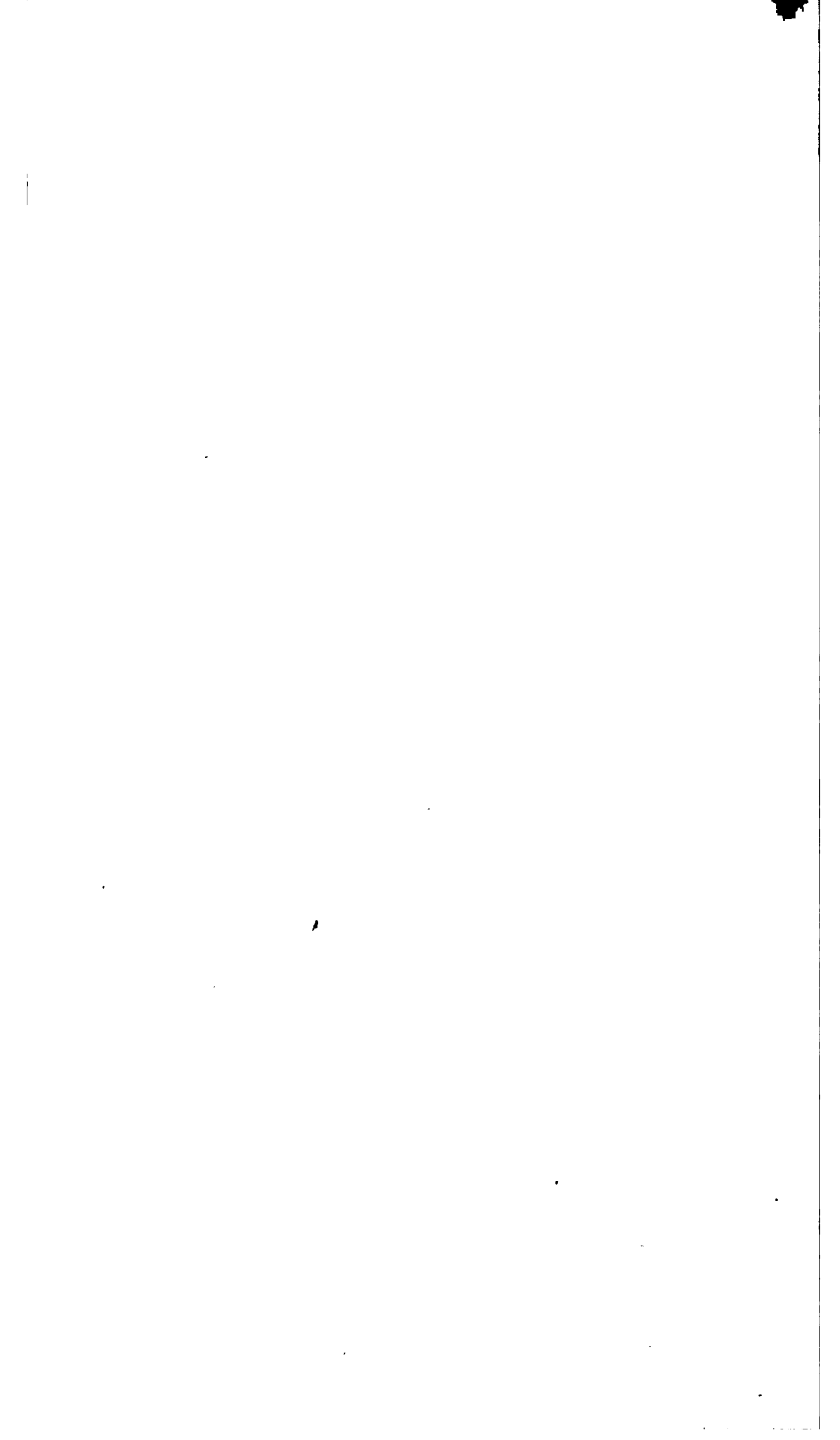


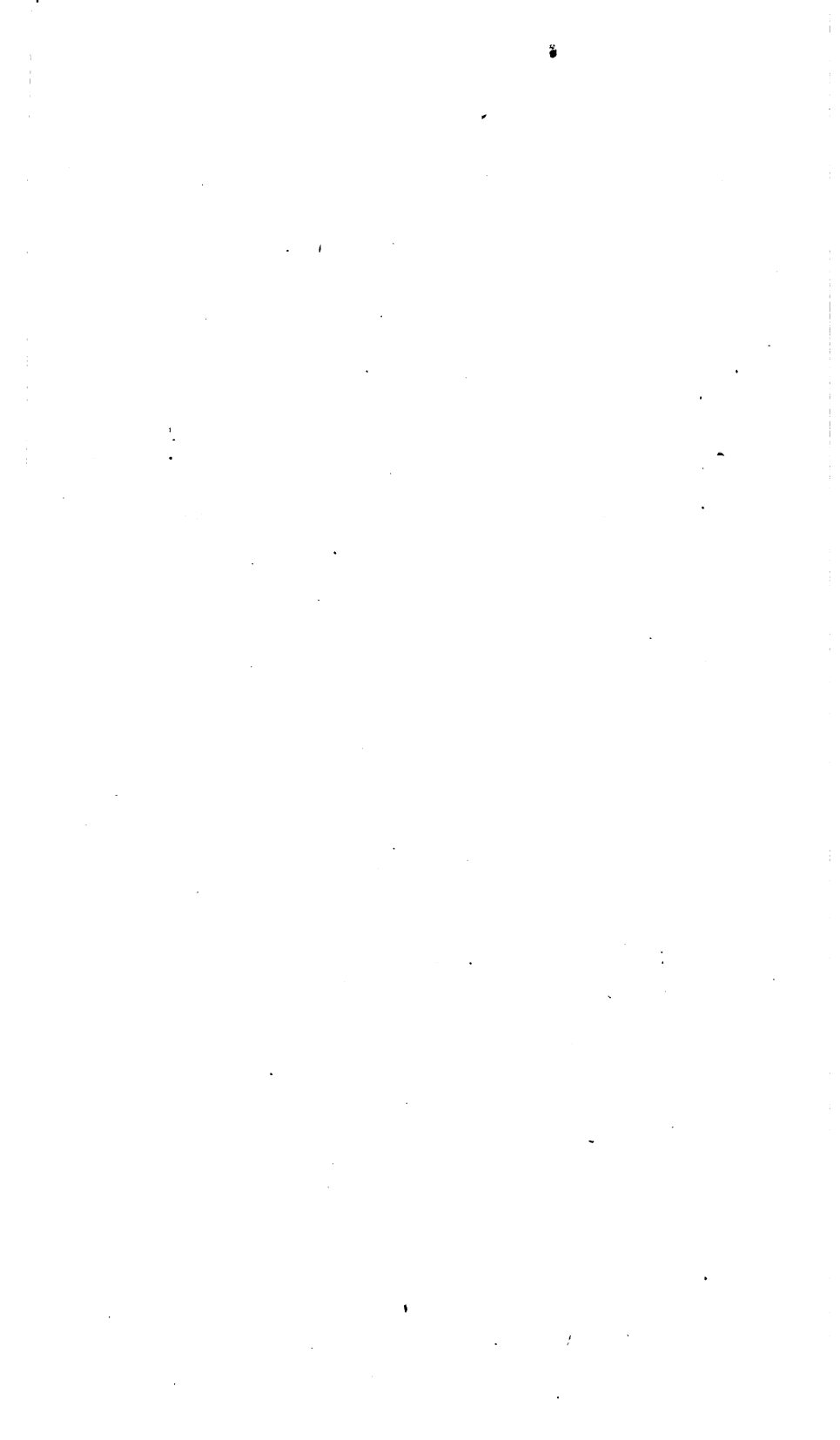
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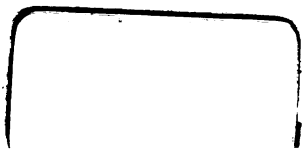
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